July 2021

Binder 164, Paramphistomatidae not from Fishes or Mammals A-H [Trematoda Taxon Notebooks]

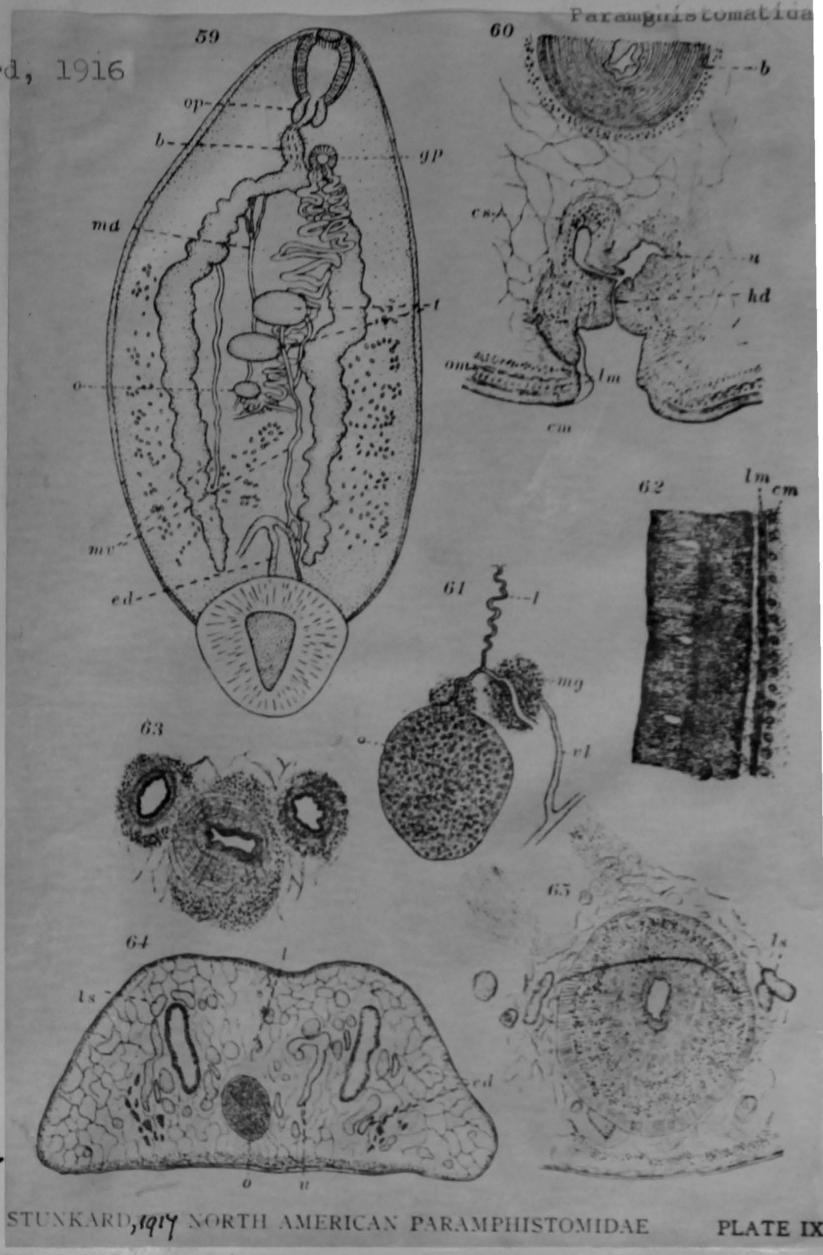
Harold W. Manter Laboratory of Parasitology

Allassostoma Stunkard, 1917

Generic diagnosis. — Paramphistomidae, Schizamphistominae: Body elongate oval. Oral diverticles and esophageal bulb present. Ceca with sinuous wall, terminating in front of acetabulum. Acetabulum terminal, with maximum transverse diameter near anterior end. Testes round, situated one obliquely behind the other in intercecal field of middle third of body. Cirrus pouch present. Genital pore median, ventral to esophageal bulb, with small genital sinus, into which opens the hermaphroditic duct formed by union of cirrus and metraterm. Ovary median or nearly so, a little behind posterior testis. Laurer's canal winding, opening middorsally. Uterine coils pre-ovarian, dorsal to testes, pretesticular; eggs large. Vitelline follicles small, extending in extracecal field from level of anterior testis to cecal ends, some follicles in postovarian intercecal area. Excretory pore middorsal, near posterior extremity; collecting vessels traced to region of oral sucker. Lymph system consisting of three (dorsal, ventral and lateral) longitudinal vessels, which are divided into numerous branches. Parasites of chelonians.

Genotype: *A. magnum* Stunkard, 1917 (Pl. 59, Fig. 717), in intestine of *Pseudemys troosti* and *P. elegans;* North America.

Alassostoma magnum Stunkard, 1916



Stunkard, 1916

ALASSOSTOMA MAGNUM

(Figures 59 to 6

STUNKARD, 1917 NORTH AMERICAN PARAMPHISTOMIDAE PLATE IX

The material of this species consists of one worm from *Pseudemys troosti* from Havana, Illinois; one from *P. elegans* from the same locality; two from *P. elegans* from Chicago, Illinois; and three specimens from an unknown turtle from Marshall, Missouri. The first four specimens were collected by the writer from the large intestine near its juncture with the small intestine, and the material from Marshall, Mo., bears the label, "From cloaca of turtle."

In the preserved state the worms are 10 to 12 mm. in length, 3 to 5 mm. in breadth, and 1.5 to 2 mm. in thickness. One specimen studied in the living condition, measured 18 mm. in length when fully extended; preserved it is 11 mm. long, 3.8 mm. wide and 2 mm. thick. One fixed specimen 10 mm. long and 3 mm. wide is not sexually mature.

In the living state the worms are clear, hyaline, with the digestive ceca visible as brown lines. Their movements are very slow. In shape (Fig. 59) they are more or less oval, with the acetabulum forming a slight caudal projection. The acetabulum is slightly sub-terminal, circular or ovoid, usually wider near the anterior than the posterior end. The opening is necessarily relatively narrower than the sucker itself, in one specimen the opening is merely a slit, 1.4 mm. long, 0.38 mm. wide near the anterior end and posteriorly tapering to a point. In the largest specimens the acetabulum is 2.5 mm. long by 2 mm. wide, and in the smallest it is 2 mm. by 2 mm.

From Stunkard, 1917 (contd. on back)

The cuticular covering of the body is unarmed, and measures 10 to 12μ in thickness. It is turned in at the openings of the excretory and reproductive systems and lines the digestive tract to the bifurcation. The dermo-muscular wall has the circular, longitudinal, and oblique layers well developed and inside the oblique layer there is an additional layer of longitudinal fibers (Fig. 60). Dorso-ventral fibers are scanty or lacking and the parenchyma of the body is very loose and vacuolated (Fig. 64).

Alimentary tract.—The oral sucker is terminal, spherical to ovoid in shape, usually longer in the antero-posterior axis and somewhat wider anteriorly than posteriorly. It is deeply set in the parenchyma of the body and measures 0.9 to 1.35 mm. in length and 0.6 to 0.9 mm. in width. Radial fibers pass from the external limiting membrane to the cuticula lining the sucker; in a cross section thru the sucker (Fig. 65), the inside two-thirds of the outer half is a nuclear zone and all the nuclei are collected in this area. Half way between the nuclear zone and the lumen there is a narrow band of circular fibers. The oral evaginations arise at the caudal end of the oral sucker by two separate openings, one on either side, and extend dorsad and caudad. They are 0.35 to 0.6 mm. long, flattened dorso-ventrally, 0.15 to 0.2 mm. in width. These sacs are lined with cuticula and their wall is continuous with that of the oral sucker. Externally there is a layer of longitudinal fibers and inside this sets of annular fibers (Fig. 63). Oblique and radial fibers are occasionally seen but are very scanty.

The esophagus is 0.6 to 1.3 mm. in length; it is lined with cuticula and the wall contains external longitudinal and internal annular fibers. At the caudal end of the esophagus, just anterior to the bifurcation of the alimentary tract, there is a prominent esophageal bulb. It varies from 0.65 to 0.95 mm. in length and from 0.33 to 0.5 mm. in width; it is formed by a thickening of the annular fibers of the wall of the esophagus. A cross section is represented in Figure 60 and shows the eighteen concentric lamellae of muscles. No nuclei are present in these annular muscles. Both the oral evaginations and the esophagus are surrounded by clusters of deeply staining cells (Fig. 63). Looss (1896) described similar cells in Gastrodiscus and believed they secrete the lining of the esophagus. The ceca are flattened laterally and are of very unequal caliber, small lateral evaginations occur on opposite sides at the same level recalling the condition in some of the Turbellaria. The diverticula extend almost to the acetablum, about 0.37 mm. intervening. They have a muscular coat consisting of external annular and internal longitudinal fibers and an epithelial lining of columnar cells which show faint longitudinal striations (Fig. 62).

Male Reproductive Organs.—The testes are slightly lobed, oval, longer in the transverse diameter, and vary in size from 0.27 by 0.35 mm. to 0.45 by 0.9 mm. They are situated one behind the other or in contracted specimens slightly on opposite sides of the median line. They are approximately the same size in any one specimen and are separated by about the length of one of the testes, tho in contracted specimens they may lie closer together. The vasa efferentia arise from the dorsal anterior margins, the duct from the posterior testis on the left and the duct from the anterior testis on the right side of the body. They pass dorsad and cephalad, and 0.4 to 0.5 mm. caudad of the bifurcation of the digestive tract they unite to form a much coiled seminal vesicle, which near the pore passes into a small, poorly developed cirrus sac. In sectioned individuals it could be seen that the seminal vesicle was filled with spermatoza. In one specimen the coils of the vesicle extend thru twenty cross sections each 15μ in thickness, and the tube is so coiled that in a section of the worm there are ten or fifteen sections of the vesicle. In another individual cut in frontal sections the seminal vesicle extends antero-posteriorly thru 0.57 mm. The prostate gland is enclosed by the cirrus sac and fills the entire region between the wall and the central canal. The cells are more numerous in the posterior part of the sac, gradually becoming fewer in the anterior region. The sac is approximately 0.37 mm. long and 0.185 mm. in diameter. It is dorsal on the right side of the body, and the terminal end of the uterus is ventral on the left side of the body.

From Stunkard, 1917

(contd. on next page)

Alassostoma magnum (cont'd.)

Female Reproductive Organs.—The ovary is spherical or oval, 0.275 to 0.35 mm. in length and 0.33 to 0.57 mm. in width, in or near the median line, about the width of the caudal testis behind the latter. The oviduct is very small and arises from the dorsal margin of the ovary (Fig. 61). After a coil posteriad Laurer's canal is given off and passes in a winding course to the dorsal surface. There is no receptaculum seminis. Just after the origin of Laurer's canal, the oviduct passes into Mehlis' gland, where the vitelline duct is received. There is no vitelline receptacle in either of the sectioned worms, but the right and left ducts are very large. They meet in the median line posterior and ventral to Mehlis' gland, and a duct passes to the ootype. The uterus coils anteriad, either between or around the testes and opens thru the hermaphroditic duct to the genital pore.

The genital pore is in the median line ventral to the œsophageal bulb, and there is a small genital sinus. The cirrus sac and metraterminal portion of the uterus open to the exterior thru a common hermaphroditic duct (Fig. 60).

The vitellaria consist of small irregularly shaped follicles, lying almost entirely in the ventral half of the body and extending from the region of the cephalic testis to the caudal ends of the ceca. Anteriorly they are extracecal, but posteriorly they extend into the intracecal area; near the ends of the ceca about half of the follicles are between the diverticula.

Eggs were present in only one specimen. Here there were three; they measured 0.1 by 0.13 mm.

Lymph System.—This system consists of three canals passing longitudinally on either side of the body, one lateral and two mesal of each cecum. Of the median pair, one is dorsal and the other ventral (Fig. 59). These canals are not straight but wind about and give off branches at various points. These branches subdivide in turn and at the ends the main trunk breaks up into numerous smaller branches so that the entire body is penetrated by ramifications of this system. The ceca, the genital organs, and the suckers are especially well supplied with lymph sinuses.

Excretory System.—The excretory pore is in the median line on the dorsal surface, near the posterior end of the body, and the median terminal vesicle extends internally and anteriorly. It gives off a branch to either side and these branches of the collecting vesicle pass anteriad, winding about the cecum of either side in many loops or coils. In sections (Fig. 64) the tube may appear on either side, above, or below the cecum; in a single section it may be cut in two or three places or a loop may pass half to two-thirds of the way around the cecum. No connections between the collecting ducts of the two sides could be seen, and they were traced to the region of the oral sucker.

From Stunkard, 1917

ALLASSOSTOMA

LOOSE LEAF
ORGANIZER

SCHEDULE

RIOD TIME								
URSE ON. STRUCTOR								
URSE UE. STRUCTOR								
URSE ED. STRUCTOR								
URSE HU. STRUCTOR								
URSE I. STRUCTOR								
URSE T. TRUCTOR								

NAME _____

ADDRESS _____

SCHOOL _____ TELEPHONE _____

Allassostomoides Stunkard, 1925

Generic diagnosis. — Paramphistomidae, Schizamphistominae: Body elongate, nearly parallel-sided, with a small projection on each side at level of anterior part of acetabulum. Acetabulum comparatively large, terminal, with ventral aperture. Oral diverticles and esophageal bulb present; ceca wide, terminating in front of acetabulum. Testes median, directly tandem, in anterior part of intercecal area. Cirrus pouch present. Genital pore at or behind intestinal bifurcation, without sucker. Ovary posttesticular, postequatorial. Uterus coiled between ovary and posterior testis. Laurer's canal present. Vitelline follicles inter- and extracecal, extending from level of posterior testis or anterior end of ceca to posterior cecal ends. Lymph system with three pairs of longitudinal trunks. Parasites of chelonians and batrachians.

Genotype: *A. parvum* (Stunkard, 1917) Stunkard, 1925 (Pl. 57, Fig. 698), in cloaca of *Chelydra serpentina*, urinary bladder of *Pseudemys picta*, *P. floridana*, *Rana catesbiana*, *R. pipiens* and *R. clamitans;* North America.

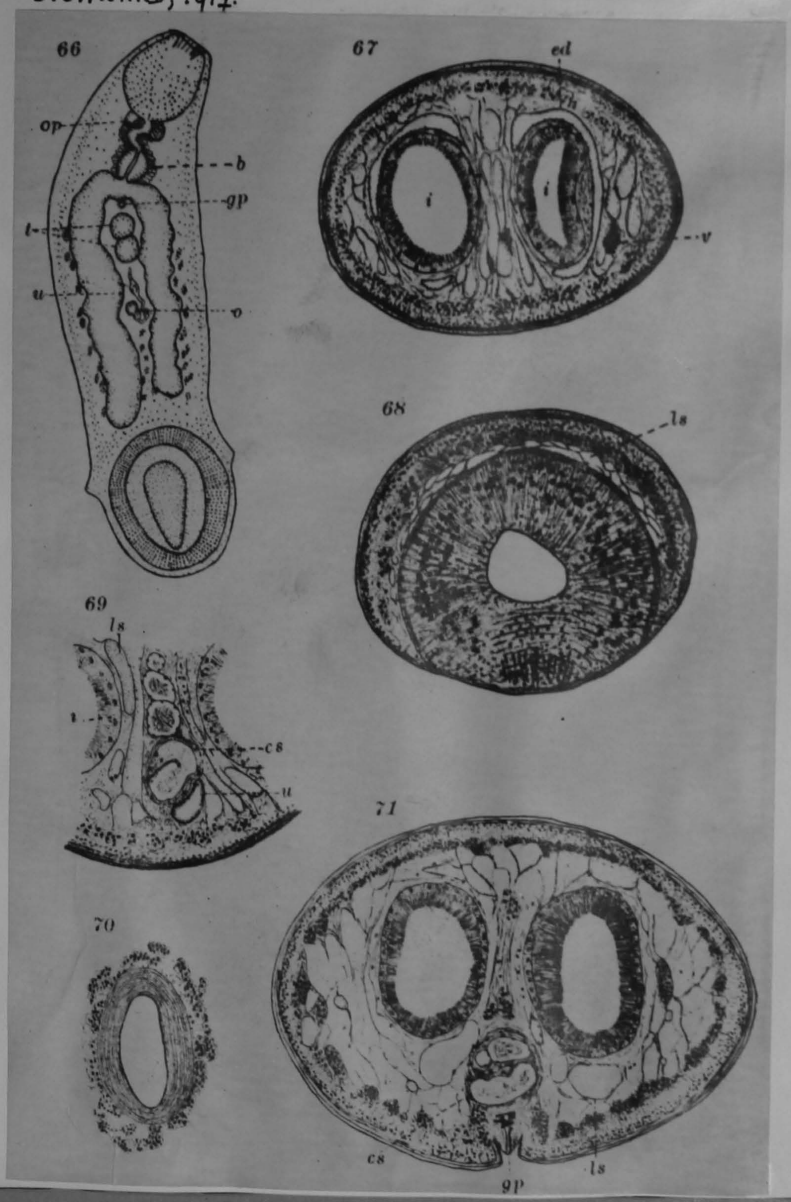
Parthenita in *Planorbis trivolvis* and *Helisoma antrosa;* cercaria probably indentical with *C. inhabilis* Cort, 1914 and *C. convoluta* Faust, 1919, encysts readily on pond lilies, and the turtles (*Chelydra serpentina*) may become infected by eating these plants — Krull (1933). Beaver (1929) found that the cercariae encysted on crayfish (*Cambarus propinquus*) and frog larvae (*Rana pipiens*) and obtained adults by feeding these to *Rana catesbiana* and *Chelydra serpentina*.

Other species: *A. chelydrae* (MacCallum, 1918) in rectum of *Chelydra serpentina*.

Paramphistomatidae

Alassostoma parvum Stunkard, 1916

STUNKARD, 1917.



***Allassostomoides parvus* (Stunkard 1916) Stunkard 1924**

synonyms: *Allassostoma parvum* Stunkard 1916
***Allassostoma Allassostomoides parvum* Stunkard 1924**

(Fig. 3)

The holotype and 3 specimens used by Stunkard (1924) in the redescription of this species were studied in addition to 40 specimens collected in Nebraska. All specimens agree with the redescription of the species, except that mature eggs range from 164 to 176 μ long rather than averaging 145 μ long.

Hosts and localities of material studied:

Chelydra serpentina (type)
Urbana, Illinois (AMNH No. 792; Stunkard, 1916, 1917)

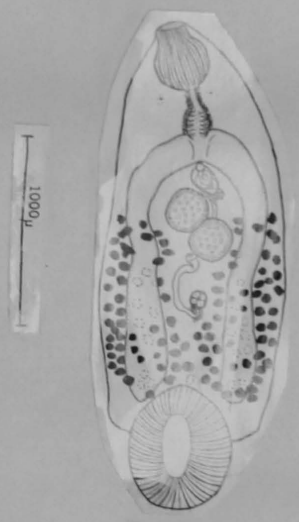
Pseudemys floridana (LeConte) (= *Chrysemys f.*), Florida painted turtle
Florida (AMNH Nos. 793 to 795; Stunkard, 1924)

Chrysemys picta
10 miles south of Humboldt, Nebraska (present report)

Rana catesbeiana
10 miles south of Humboldt, Nebraska (present report)

Type specimens: Holotype AMNH No. 792.

Brooks, 1975



ALASSOSTOMA PARVUM Stunkard, 1916

Three individuals of this species were collected from the cloaca of a single specimen of *Chelydra serpentina* from Urbana, Illinois. One was retained as an alcoholic specimen, one was stained and mounted as a toto preparation, and the third was cut into cross sections.

The worms (Fig. 66) are thick with almost parallel sides, rounded at the posterior end and tapering slightly anteriorly. Just in front of the acetabulum the body narrows slightly and then widens posteriorly due to the presence of two lateral prominences or evaginations, one on either side at the level of the anterior part of the acetabulum. The worms are 2.8 to 3 mm. long and 0.78 to 0.08 mm. wide, the points of greatest width are at the level of the testes and thru the posterior lateral prominences. The sectioned worm is 0.8 mm. in width and 0.54 mm. in thickness. The acetabulum is subterminal, oval, 0.8 mm. in length and 0.7 mm. in width in the toto preparation. The inside measurements of the same sucker are 0.56 mm. in length by 0.4 mm. in width and the opening is 0.45 mm. in length and 0.21 mm. in greatest width.

Alimentary Tract.—The oral sucker is terminal, ovoid, 0.46 mm. long by 0.37 mm. wide, and in the sectioned worm 0.32 mm. in depth. In the mounted specimen the sucker is widest posteriorly, and from the posterior dorsal part on either side there is an oral evagination. These arise separately and are 0.055 mm. long. Among the fibers of the oral sucker there are many nuclei; they are situated in the peripheral half of the sucker and are confined to the central two-thirds of the external half. There are also among the muscle fibers glandular cells with ducts to the lumen of the sucker. The esophagus is somewhat coiled but extends thru 0.2 mm. and is surrounded by large deeply staining gland cells. The posterior part is enlarged by the thickening of the annular muscles of the wall which forms the esophageal bulb (Fig. 70). This structure comprises twelve concentric rings or lamellae of muscles. It is 0.2 mm. long by 0.14 mm. wide in the toto specimen and 0.314 mm. in depth in the sectioned individual. The diverticula extend posteriad almost to the cephalic margin of the acetabulum. In sections they are oval, and flattened laterally. In the intestine of the sectioned worm there are masses of small nuclei, possibly from the epithelial lining of the cloaca of the host.

Male Reproductive Organs.—The testes are oval, in the toto specimen they are 0.17 mm. long by 0.17 mm. wide, and in the sectioned worm 0.17 mm. wide by 0.29 mm. thick. They are situated one in front of the other in the median line and in the ventral part of the body. They are close together, separated only by a thin fibrous sheet. The vasa efferentia arise at the dorsal margins of the testes; the duct from the caudal testis pass anteriad and anterior to the cephalic testis unites with the duct from this latter testis. The vas deferens immediately expands into a long much-coiled seminal vesicle which passes anteriad and into the cirrus sac (Fig. 69). Inside the cirrus sac the tube continues in large coils; the terminal part is surrounded by the cells of the prostate gland and opens to the surface thru a short hermaphroditic duct. There is a small genital papilla (Fig. 71).

Female Reproductive Organs.—The ovary is oval: in the toto specimen it is 0.098 mm. long and 0.088 mm. wide, and in the sectioned worm it is 0.95 mm. wide and 0.134 mm. thick. It is median in position and situated midway between anterior and posterior ends of the body. The oviduct arises at the dorsal posterior margin and passes dorsad and posteriad into Mehlis' gland. This gland is large and well developed. Here Laurer's canal is given off and passes in short coils to the dorsal surface. Just after the origin of Laurer's canal a short common vitelline duct opens into the ootype and the oviduct passes ventrad. It expands to form the initial part of the uterus, turns anteriad, and is filled with masses of spermatoza. The expanded portion of the uterus extends anteriad half the distance to the caudal testis and then the tube contracts, passes dorsad and in a winding course over the testes. Anterior to the testes it turns ventrad and enters the hermaphroditic duct on the posterior ventral side. The vitellaria extend from the region of the testes to the caudal ends of the digestive ceca and consist of scattered lobes, mostly ventral in position. Anteriorly they are extracecal but behind the ovary they are intracecal as well.

No eggs were present in any of the specimens.

The genital pore is in the midventral line, just posteror to the bifurcation of the alimentary tract. There is a genital sinus but no genital sucker.

Lymph System.—The lymph system is similar to that described for *A. magnum* and consists of the three longitudinal canals on either side of the body, one canal lateral to each cecum and a pair, one dorsal and the other ventral, mesal to the diverticulum of either side. The secondary branchings could not be traced but lymph sinuses are present in sections in all parts of the body, and those around the acetabulum are shown in Figure 68.

Excretory System.—The excretory pore is median, dorsal, at the level of the cephalic margin of the acetabulum. A short median vesicle passes ventrad and anteriad and divides into two collecting vesicles as in *A. magnum*. These pass ventrad and posteriad, one on either side, loop around the caudal ends of the diverticula, and then turn anteriad, winding around the ceca in many irregular coils so that in sections they appear lateral, mesal, ventral or dorsal to the intestine; often the tube is cut two or three times in the same section or a single section may show a coil encircling the cecum for half or more of its circumference (Fig. 67). Anterior to the bifurcation of the alimentary tract the ducts continue in the lateral areas of the body and can be traced almost to the oral sucker.

From Stunkard, 1917

***Allassostomoides chelydrae* (MacCallum 1919) Yamaguti 1958**

synonym: *Paramphistomum chelydrae* MacCallum 1919

(Figs. 1, 2)

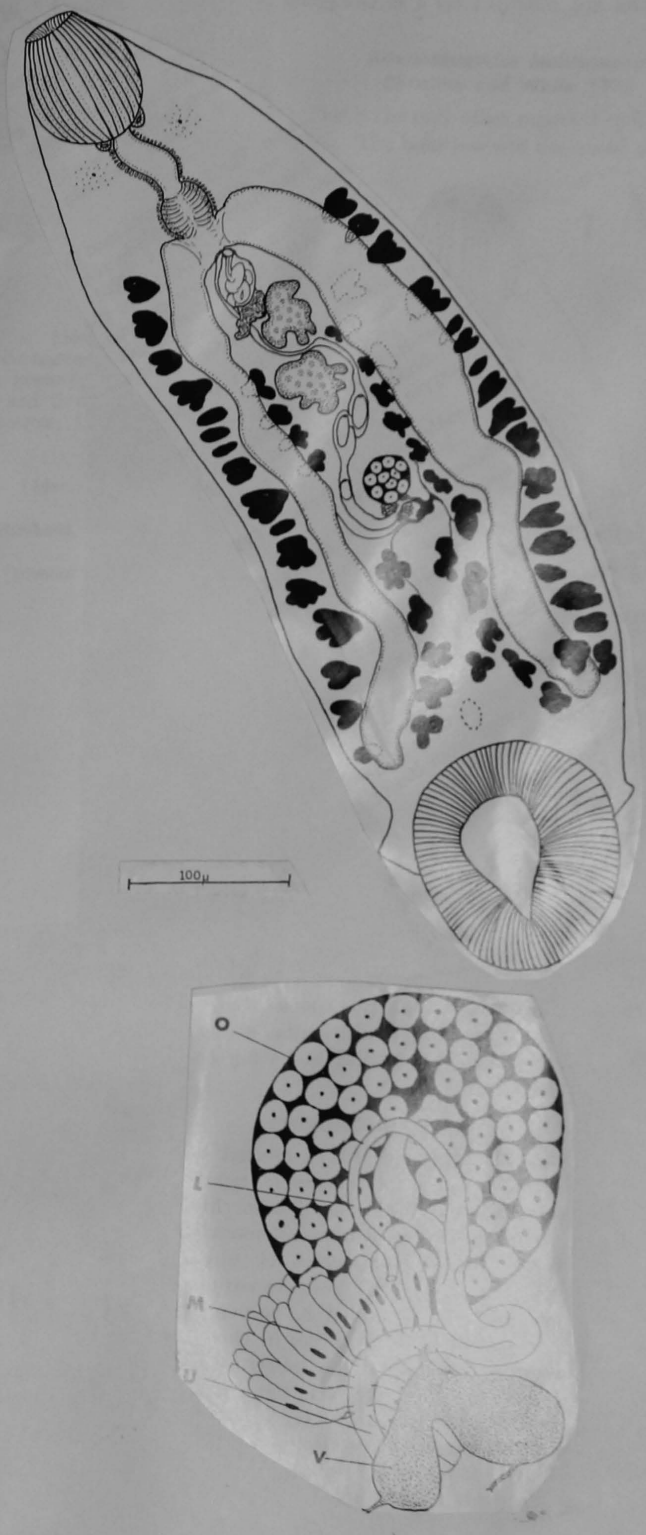
Stunkard (1924) noted discrepancies between MacCallum's (1919) written description and figure. The following redescription is based on the three specimens used by MacCallum, seven specimens from Dr. Horace W. Stunkard's collection, and 10 specimens collected in Nebraska. MacCallum's original measurements are included in parentheses.

Redescription

Body elongate, robust, with prominent lateral projections at posterior end; eyespot pigment diffuse; length 2.114 to 5.589 mm (5.5 mm), width 0.494 to 1.758 mm (1.6 mm). Oral sucker terminal, 300 to 802 (90) long by 227 to 632 (60) wide; 2 small diverticula present at posterior end of oral sucker. Esophagus muscular, passing between diverticula, surrounded by gland cells, with posterior bulb 125 to 324 (80) long. Cecal bifurcation ¼ body length from anterior end; ceca ending near posterior end of body. Acetabulum terminal with elongate ventral aperture, 462 to 1,240 (130) by 421 to 1,200 (130); ratio of sucker widths 1:1.85 to 1:1.9. Testes lobed, occasionally highly irregular, tandem or oblique, in anterior region of intercecal space; anterior testis 121 to 389 (43) by 121 to 308 (25), posterior testis 121 to 405 (60) by 121 to 365 (40). Vasa efferentia join vas deferens anterodorsal to anterior testis; vas deferens joins convoluted external seminal vesicle dorsal to cirrus sac; cirrus sac immediately postbifurcal, saccate, containing convoluted cirrus, 104 to 455 (not given) long. Genital pore ventral, median, immediately postbifurcal. Ovary spherical, 65 to 275 (30) in diameter, posttesticular, at midbody. Ootype posterodorsal to ovary; Laurer's canal and prominent Mehlis' gland present. Uterus extending anteriorly in intercecal region, somewhat coiled between ovary and posterior testis, passing between testes, joining shallow genital atrium dorsolateral to cirrus sac. Vitelline follicles numerous, irregular, extending from cecal tips to testicular level intercecally and to level of cirrus sac extracecally, with some follicles dorsal and ventral to ceca; vitelline reservoir posterodorsal to ootype. Mature uterine eggs 154 to 184 (20) by 105 to 123 (12). Lymph system composed of 3 tubes on each side of body, 1 lateral and 2 mesad to ceca; mesad pair arranged dorsoventral to each other; lymph reservoir at posterior end of body, dorsal to excretory vesicle. Excretory vesicle saccate, short; main collecting ducts paired, each spiraling around a cecum; excretory pore dorsal, immediately preacetabular.

Hosts and localities of material studied:

Chelydra serpentina (L.), common snapping turtle (type host)



FIGURES 1–3. *Allassostomoides chelydrae* (MacCallum 1919) Yamaguti 1958 and *A. parvus* (Stunkard 1916) Stunkard 1924. **1.** *Allassostomoides chelydrae*, ventral view of lectotype. **2.** *A. chelydrae*, dorsal view of ootype from a homotype. **3.** *A. parvus*, ventral view of a specimen from *Rana catesbeiana* in Nebraska. Figs. 1 and 3 drawn to same scale. Abbreviations: O, ovary; M, Mehlis' gland; U, uterus; V, vitelline reservoir; L, Laurer's canal.

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New York Aquarium, locality unknown (MacCallum, 1919)
Louisiana (AMNH Nos. 796 to 802; Stunkard, unpublished)
10 miles south of Humboldt, Nebraska (present report)

Chrysemys picta (Schneider), painted turtle (new host record)
1.5 miles south of Brownville, Nebraska (present report)
Graptemys pseudogeographica (Grey), false map turtle (new host record)

1.5 miles south of Brownville, Nebraska (present report)
Bufo americanus (Holbrook), American toad (new host record)
Oklahoma (AMNH Nos. 803 to 804; gift of Dr. Louis Bouchard, Stunkard, pers. comm.; Stunkard, unpublished)
Rana catesbeiana Shaw, bullfrog (new host record)
0.5 miles west of Verdon, Nebraska (present report)

Type specimens: The 3 specimens used by MacCallum (1919) are arranged side-by-side on a single slide (USNM Helm. Coll. No. 36261). The middle specimen is clearly identifiable as the one figured by MacCallum, and I am designating it the lectotype by circling it; the other 2 specimens are paralectotypes. The 10 specimens collected in Nebraska are designated homotypes.

Lectotype and 2 paralectotypes USNM Helm. Coll. No. 36261
2 homotypes USNM Helm. Coll. Nos. 73946–7
2 homotypes H. W. Manter Laboratory, University of Nebraska State Museum No. 20074
Other homotypes in collection of author

Worms were removed from the host rectum, flattened with slight coverslip pressure, fixed with AFA, stored temporarily in 70% ethanol, stained with Mayer's hematoxylin, and mounted in Canada balsam for study as whole mounts. Representative specimens are on deposit with the Harold W. Manter Laboratory. All measurements are in microns unless otherwise stated.

DISCUSSION

Stunkard (1916, 1917) erected the genus *Allassostoma* for *A. magnum* (type) and *A. parvum* from turtles in Illinois. MacCallum (1919) described *Paramphistomum chelydrae* from *Chelydra serpentina* of unknown locality from the New York Aquarium. Stunkard (1924) redescribed *A. parvum* based on new collections from turtles in New York and Florida and erected the subgenus *Allassostomoides* for it. At the same time, he suggested that *P. chelydrae* might be a synonym of *A. parvum* based on irregularities in MacCallum's (1919) description. Stunkard (1925) and Fuhrmann (1928) published synopses of the amphistomes and digeneans, respectively, each listing *Allassostomoides* as a distinct genus with no discussion. Beaver (1929) and Krull (1933) published on the life cycle of *A. parvum*, but their reports are sufficiently divergent to suggest that different species may have been involved. Travassos (1934) elevated *Allassostomoides* to generic rank, and designated *A. parvum* the type species, listing *P. chelydrae* as a synonym of *A. parvum*, as did Skrjabin (1947). Yamaguti (1958, 1971) accepted *P. chelydrae* as a valid species, but transferred it to *Allassostomoides*. At the same time, he emended the name of the type species to *A. parvus* to agree in gender with the generic name. Other reports of *A. parvus* and *A. chelydrae* have contained no morphological data. Because it has generally been considered to be a synonym of *A. parvus* since 1924, specimens of *A. chelydrae* collected in subsequent studies may have been reported as *A. parvus*. The specimens collected in Nebraska fall into two distinct categories, one of which agrees with *A. chelydrae* and the other with *A. parvus*.

Brooks, 1972

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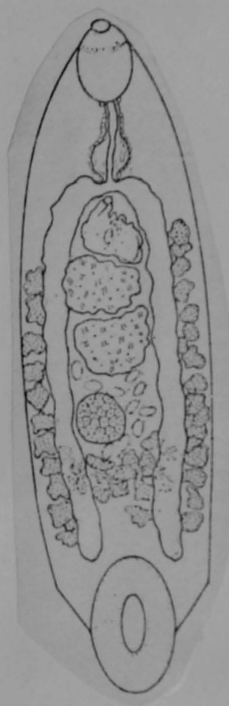
Paramphistomidae

Allassostomoides louisianaensis ~~n. sp.~~ Christian and White, 1972

Description (based on 10 mature specimens); Body elongate, typically amphistomid, 3.5 to 4.1 long by 1.0 to 1.2 wide, tegument aspinose. Oral sucker oval, terminal 0.42 to 0.50 long by 0.33 to 0.36 wide; mouth terminal, oral evagination present and small but hardly observable in some specimens. Acetabulum, 0.65 to 0.70 long by 0.58 to 0.62 wide, oval, terminal, at posterior end of body, with ventral aperture. Slight lateral body projections present at posterior end of body length on both anterior borders of acetabulum. Esophagus straight tube, surrounded along its length by deeply staining gland cells, posteriorly enlarging into ovoid to oblong bulb of laminated muscle fibers; esophagus with bulb measuring 0.46 to 0.52 long, bulb alone 0.26 to 0.30 long by 0.18 to 0.19 wide; ceca, irregularly shaped, extending from base of esophageal bulb to anterior portion of acetabulum. Testes tandem, nearly broadly contiguous, irregularly shaped to strongly lobate, one before the other; in anterior half of worm, situated almost in median plane; anterior testis 0.36 to 0.42 long by 0.36 to 0.44 wide; posterior testis 0.35 to 0.40 long by 0.35 to 0.41 wide. Cirrus sac large, irregularly shaped, containing highly convoluted cirrus. Ovary spherical, entire to slightly notched, 0.16 to 0.21 long by 0.16 to 0.21 wide, almost median, postequatorial and posttesticular, Mehlis' gland large, to the left of the ovary, oval to irregularly shaped. Uterus filled with 6-12 eggs, extending from posterior borders of ovary to genital pore. Eggs oval, large, 0.11 to 0.16 long by 0.08 to 0.09 wide. Genital pore median, just posterior to intestinal bifurcation. Vitellaria follicular, large, irregularly shaped, extending from anterior level of anterior testis to posterior cecal ends, extracecal and adcecal to the level of posterior testis then becoming both extra- and intracecal down to anterior level of acetabulum; excretory pore median just anterior to acetabulum.

Host: Pig frog (*Rana grylio*).
Site of infection: Large intestine.
Type locality: Morgan City, La.
Holotype: USNM Helm. Coll. No. 72297.
Paratypes (2): USNM Helm. Coll. No. 72298.



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Materials and Methods

Worms were studied alive in amphibian Ringer's solution under a cover slip, and also as permanent whole mounts. Worms were killed in hot AFA, or warm 70% alcohol, stained in Semichon's acetic carmine, and mounted in balsam. Figure 1 was drawn with the aid of a camera lucida and a microjector, and measurements are in millimeters unless stated otherwise.

Discussion

In general arrangement of the reproductive structures, body dimensions and size relationships of the organs. *Allassostomoides louisianaensis* n. sp. most resembles *A. parvum;* it differs in having irregularly shaped to strongly lobate testes, a further anterior extension of vitellaria to the level of cirrus sac, and a much larger and irregularly shaped cirrus sac with highly convoluted cirrus and seminal vesicle. *A. louisianaensis* also differs from *A. chelydrae* in having contiguously tandem rather than diagonally placed testes, and in having anterior extension of vitellaria not up to the level of esophageal bulb as in *A. chelydrae.*

Stunkard (1924) noted, correctly, that the figure given for *Allassostomoides chelydrae* agrees with its description, but the measurements of the organs do not agree with the figure as given by MacCallum (1918). This, therefore, makes it difficult to compare *A. chelydrae* with other species on the basis of structural dimensions as given by MacCallum.

We believe that the only reliable morphological criterion for separating the species of this genus is the consistency in the arrangement, form and shape of the reproductive structures and other organs.

Key to the species of the genus *Allassostomoides*

1. Testes tandem and contiguous 2
   Testes diagonal and lobate, vitellaria extending anteriorly to posterior level of esophageal bulb ..... *A. chelydrae*
2. Testes round ..... *A. parvum*
   Testes irregularly shaped to strongly lobate ..... *A. louisianaensis* n. sp.

—over—

Stunkard (1916, 1917) described *Allassostoma parvum* for three sexually
mature paramphistomid trematodes he found in the cloaca of a turtle, *Chely-*
ra serpentina, from Illinois. Based on his finding of an additional four sexually
ature specimens of *A. parvum* from the urinary bladders of *Chrysemys picta*
om New York, *Pseudemys floridana* and *Chelydra serpentina* from Florida,
tunkard (1924) redescribed *A. parvum* and transferred it to his newly erected
nus *Allassostomoides.*

MacCallum (1918) described a new amphistome, *Paramphistomum chely-*
rae, from the rectum of *Chelydra serpentina;* but Stunkard (1924) transferred
chelydrae to his new genus, *Allassostomoides,* and expressed the possibility
P. chelydrae being specifically identical with *A. parvum.* Yamaguti (1958)
garded the two forms as two separate species belonging to the same genus,
llassostomoides.

Beaver (1929) experimentally determined the life cycle and development of
parvum and reported its natural occurrence in amphibian hosts (*Rana cates-*
iana, R. clamitans and *R. pipiens*) in Illinois.

During the summer of 1971, 56 specimens of what appeared to be a new
ecies of *Allassostomoides* Stunkard, 1924, were taken from the large intestine
ectum) of 10 pig frogs, *Rana grylio,* collected from the vicinity of Morgan
ity, La. None of the turtles (*Chelydra serpentina, Chrysemys picta* and *Ter-*
pene carolinensis), collected from the same locality as the pig frogs, harbored
y specimens of *Allassostomoides* in either their cloaca (rectum) or urinary
adders.

Christian and White, 1972

Allassostomoides louisianaensis
Christian and White 1973

This is the only other reported species of the genus. The holotype was examined and found to agree completely with the description by Christian and White (1973). It has been reported only from the pig frog, *Rana grylio,* in Louisiana.

Hosts and localities of material studied:

Rana grylio (Stejneger), pig frog (type)
Louisiana (Christian and White, 1973)

Type specimens: Holotype USNM Helm. Coll. No. 72297; 2 paratypes USNM Helm. Coll. No. 72298.

Remarks

Allassostomoides chelydrae has lobed to highly irregular noncontiguous testes and extracecal vitelline follicles extending to the level of the cirrus sac or genital pore. *A. parvus* has spherical contiguous testes and extracecal vitelline follicles extending only to the middle of the anterior testis. *Allassostomoides louisianaensis* possesses a seminal vesicle and cirrus sac which are much larger in proportion to the body than either of the other two species, but resembles *A. chelydrae* in the distribution of the vitelline follicles and *A. parvus* in having contiguous testes.

Brooks, 1975

Allassostomoides louisianaensis
Christian and White 1973

Host: *Siren intermedia,* new host.
Site: Rectum.
Locality: Roadside ditches, 2 miles north of Gorham, Jackson Co., Illinois.
Specimens deposited: 5, Univ. Neb. State Mus., H. W. Manter Lab. No. 20269.

Remarks

Allassostomoides louisianaensis was described from the pig frog, *Rana grylio* Stejneger, from Louisiana. Five specimens obtained from four sirens exhibited the features of *A. louisianaensis* as noted by Brooks (1975).

Brooks and Buckner, 1976

ALLASSOSTOMOIDES

Catadiscus Cohn, 1904

Generic diagnosis. — Paramphistomidae, Diplodiscinae: Body approximately conical to pyriform. Acetabulum ventroterminal, constricted into two portions. Oral diverticles prominent. Esophageal bulb present; ceca short, terminating some or considerable distance anterior to acetabulum. Testes single, median or submedian, intercecal, or just behind level of cecal ends. Vesicula seminalis externa and cirrus pouch present. Genital pore bifurcal or postbifurcal. Ovary submedian, posttesticular. Vitelline follicles extending on each side, entirely behind ceca or partly overlapping them, occasionally confluent anteriorly. Uterine coils between acetabulum and intestine, may often reach to lateral margins of body. Parasitic in intestine of amphibians and reptiles.

Genotype: *C. dolichocotyle* (Cohn, 1903) Cohn, 1904 (Pl. 59, Fig. 719), syn. *Amphistoma d.* C., in *Herpetodryas fuscus;* South America.

Representatives from reptiles:

C. freitaslenti Ruiz, 1943, in *Liophis miliaris;* Brazil.

Paramphistomidae
Diplodiscinae

CATADISCUS Cohn, 1904

Diagnosis after Cohn, 1904:
Terminal sucker elongate-oval, ventral sub-terminal, divided by a constriction into two parts. One testis. Genital pore median a little in front of the midbody, immediately posterior to intestinal bifurcation. Esophagus long, straight; a pharynx near the bifurcation. Excretory canal with typical concretions.
Type species: Catadiscus dolichocotyle (Cohn)
Host: Herpetodryas fuscus - South America

Others:
Catadiscus propinquus de Freitas & Dobbin, 1956
in Liophis miliaris
Brazil

Cataditscus Cohn, 1904

Generic diagnosis. — See p. 551.

Representatives from amphibians:

*C. **cohni*** Travassos, 1926 (Pl. 39, Fig. 492), in ***Bufo marinus;*** Brazil.

*C. **inopinatus*** Freitas, 1941 (Pl. 40, Fig. 498), in ***Leptodactylus ocellatus;*** Brazil, Paraguay.

*C. **freitaslenti*** Ruiz, 1943, in ***Liophis miliaris, Bufo paracnemis*** and ***Leptodactylus ocellatus;*** Paraguay.

*C. **marinholutzi*** Freitas et Lent, 1939, in ***Leptodactylus ocellatus,*** *L. caliginosus;* Brazil.

*C. **mirandai*** Freitas, 1943, in ***Hemipera carvalhoi;*** Brazil.

C. pygmaeus (Lutz, 1928) in ***Pseudis paradoxa;*** Venezuela.

*C. **uruguayensis*** Freitas et Lent, 1939, in ***Leptodactylus ocellatus;*** Uruquay.

Paramphistomidae
at

Cataditscus cohni Travassos, 1926

Figura 3 a 9

Cataditscus cohni Travassos, 1926, pp. 278-279, fig.
Cataditscus cohni Travassos, 1934, pp. 101, 150.
Cataditscus cohni Walton, 1938, p. 29.

Corpo subpiriforme, medindo 1,21 a 2,21 mm. de comprimento por 0,80 a 1,47 mm. de maior largura. Cuticula lisa. Ventosa oral com a bôca de rebordo levemente ondulado, terminal, provida de diverticulos grandes, quasi do comprimento do prefaringe, e medindo, sem os diverticulos, 0,10 a 0,15 mm. de comprimento e, com eles, 0,22 a 031 mm. A largura medida ao nivel dos diverticulos é de 0,22 a 0,27 mm. Prefaringe delgado, com 0,17 a 0,20 mm. de comprimento. Faringe musculoso, com 0,12 a 0,17 mm. de comprimento por 0,08 a 0,10 mm. de largura. Esôfago nulo ou quasi nulo. Cecos relativamente curtos, largos, obliquos, terminando acima do equador do corpo. Acetábulo subterminal com 0,70 a 0,77 mm. de comprimento por 0,57 a 0,60 mm. de largura, apresentando um estrangulamento transversal mediano, mais ou menos acentuado. Poro genital precequatorial, mediano, bifurcal. Bolsa do cirro pequena e delgada, com 0,08 a 0,10 mm. de comprimento por 0,05 a 0,07 mm. de largura. Testiculo único, mais ou menos mediano, arredondado ou um pouco alongado, situado logo abaixo da zona cecal ou na sua porção posterior, medindo 0,15 a 0,20 mm. de comprimento por 0,10 a 0,13 mm. de largura. Em exemplares completamente repletos de ovos o testiculo se atrofia, não sendo mais possivel evidenciá-lo. Ovário geralmente ligeiramente lateral, com zona e campo proximos ou afastados dos do testiculo, em alguns exemplares havendo parcial superposição de suas zonas e campos, arredondado, alongado ou fracamente irregular, medindo 0,10 a 0,20 mm. de comprimento por 0,07 a 0,10 mm. de largura. Glandula de Mehlis equatorial ou levemente postequatorial, geralmente em parte no campo e na zona do ovário. Vitelinos constituidos por folículos relativamente pouco numerosos, mais ou menos volumosos, situados mais ou menos lateralmente, extendendo-se da zona cecal para traz, atingindo ou não a zona acetabular. Útero dorsal, ocupando toda a largura do corpo, extendendo-se da zona bifurcal até quasi a extremidade posterior do corpo. Ovos operculados, com 0,080 a 0,088 mm. de comprimento por 0,042 a 0,046 mm. de largura. Sistema linfático presente, complexo.

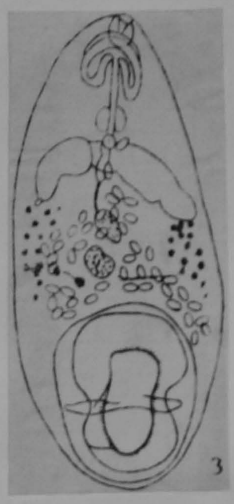
Habitat — Intestino grosso de *Bufo marinus* (L.).
Distribuição geográfica — S. Paulo (Butantan) — Brasil.

Examinamos 7 exemplares colhidos e determinados por Travassos. Não pudemos examinar o tipo por ter ele se perdido. Entre a descrição que damos e a de Travassos observam-se duas medidas levemente menores nestes exemplares: o comprimento da bolsa do cirro (0,2 mm. segundo Travassos) e o comprimento dos ovos (maximo de 0,094 mm., segundo Travassos). São elas, entretanto, compativeis com as variações individuais, às vezes mais extensas.

Com exceção de um único exemplar (figura 9) todos os demais exemplares examinados, que forem desenhados, se apresentavam inteiramente repletos de ovos, havendo, por êste motivo, uma atrofia do testiculo, que, assim mesmo, foi ainda evidenciado em um exemplar (figura 5).

A distribuição geográfica desta espécie continúa imprecisa porquanto o Instituto Butantan, de onde proveio o único material obtido, recebe material de várias proveniências, não tendo sido possivel Travassos precisar a dos batráquios parasitados.

-over-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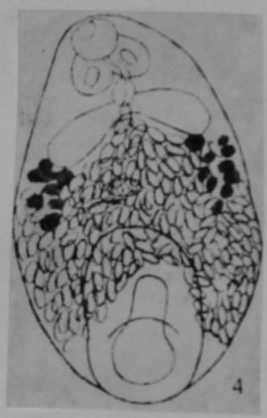
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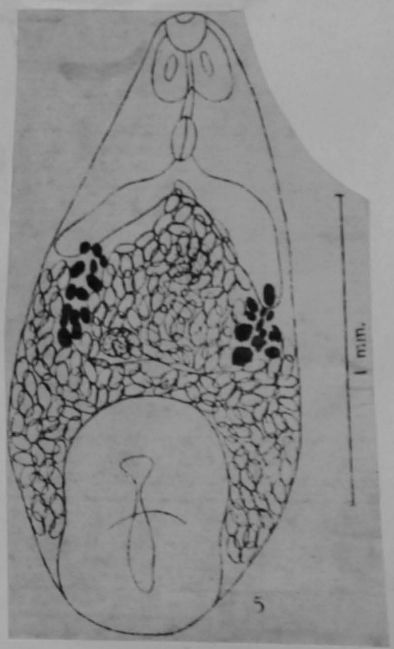

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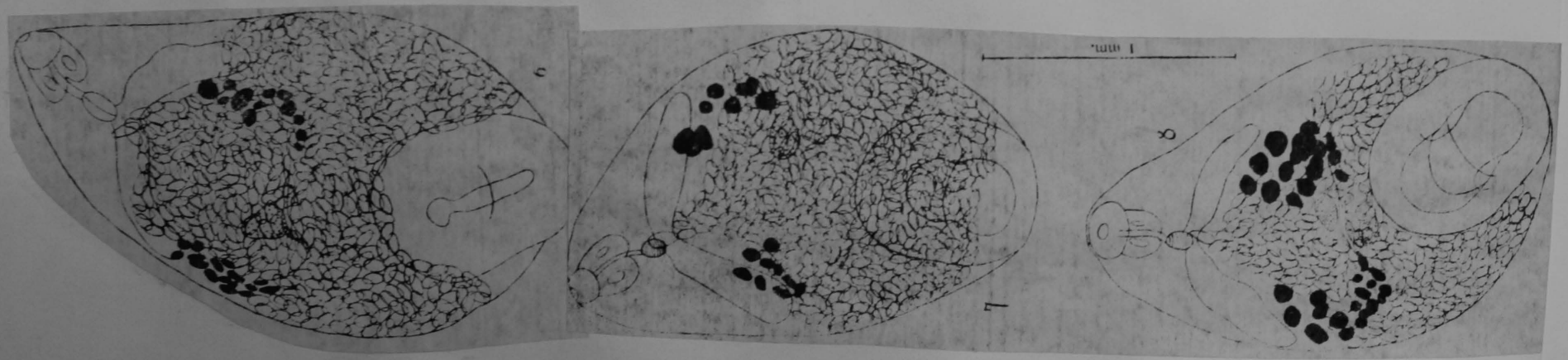

1 mm.

Paramphistomidae

De Freitas, JFT 1938

Cataldiscus dolichocotyle (Cohn, 1903) Cohn, 1901

Figura 1

Amphistomum dolichocotyle Cohn, 1903, pp. 37-39, fig. 3.
Cataldiscus dolichocotyle Cohn, 1904, p. 243.
Cataldiscus dolichocotyle Stiles & Goldberger, 1910, p. 249.
Cataldiscus dolichocotyle Stunkard, 1917, p. 343.
Cataldiscus dolichocotyle Fukui, 1929, pp. 332, 347.
Cataldiscus dolichocotyle Travassos, 1934, pp. 103-104, fig. 62.

Corpo piriforme, medindo 0,9 a 1 mm. de comprimento por 0,42 mm. de maior largura. Ventosa oral grande, medindo 0,16 por 0,13 mm., com dois diverticulos grandes, laterais. Prefaringe delgado e com 0,12 mm. de comprimento. Faringe esférico, pequeno, com 0,06 mm. de diâmetro. Cecos curtos, mais ou menos finos, terminando antes dos vitelinos mais ou menos na parte posterior da zona testicular. Acetábulo possuindo mais do dobro da ventosa oral com os diverticulos, com 0,37 por 0,30 mm., subterminal, possuindo duas cavidades, uma atrás da outra, a primeira totalmente ventral e a segunda mais terminal; bordos da ventosa fazendo uma saliência lateral entre as duas cavidades que são separadas medianamente por um espessamento. Poro genital precequatorial, situado abaixo da bifurcação cecal e logo adiante do testículo, que é esférico, mediano, e com 0,17 mm. de diametro. Bolsa do cirro cilindrica, alongada posteriormente. Canal deferente muito sinuoso, indo da parte posterior do testículo e passando por trás deles. Ovario esférico, pequeno, com 0,075 mm. de diâmetro, ao lado direito da linha mediana, em parte na zona testicular. Espermateca alongada, na altura do ovário. Canal de L a u r e r curto com orificio de saida dorsal, na zona testicular. Glandula de M e h l i s ao lado do ovário, mais para a linha mediana, redonda e compacta, mais ou menos do mesmo tamanho do ovário. Vitelinos de poucos folículos, ao lado das margens do acetábulo. Utero dorsal. Ovos grandes, com 0,073 por 0,036 mm. Poro excretor dorsal, mais ou menos na altura do meio do acetábulo. Vesicula excretora curta e larga. Sistema limfático presente.

Habitat — Intestino grosso de *Chironius fuscus* (L.) (= *Herpetodryas fuscus* Boul.)

Distribuição geográfica — América do Sul.

Esta descrição é adaptada da original, de C o h n, a única conhecida até agora. Acreditamos que as referências feitas pelo autor ao sistema excretor devem se referir ao systema limfático. Reproduzimos, também, a figura original, a única existente.

Paramphistomatidae

Catadiscus dolichocotyle COHN, 1913

(Figura 8)

Cuerpo subpiriforme, dos o tres veces más largo que ancho, mide 1.40 mm. a 1.55 mm. de largo por 0.41 mm. a 0.59 mm. de ancho máximo a nivel de la región ecuatorial del cuerpo. La cutícula es lisa, sin espinas. La ventosa oral es terminal, mide 0.09 mm. de largo por 0.13 mm. a 0.15 mm. de ancho; posee dos divertículos bien desarrollados que miden, cada uno, 0.13 mm. de largo por 0.09 mm. a 0.11 mm. de ancho, de una longitud aproximadamente igual a la prefaringe. Esta es angosta y de paredes delgadas. La faringe, muy poco desarrollada, es poco visible en los ejemplares examinados por superponerse el poro genital sobre ella; mide 0.10 mm. a 0.13 mm. de largo. No existe esófago. La bifurcación cecal está situada en la región preecuatorial del cuerpo, a nivel del cuarto anterior; los ciegos son cortos, subcilíndricos, de dirección oblicua con respecto al eje longitudinal del cuerpo, terminando por encima de la línea ecuatorial, y por supuesto siempre muy alejados del borde anterior del acetábulo; los vitelógenos se sitúan posteriormente a sus extremos.

El acetábulo es subterminal, grande, de forma generalmente oval, representa ⅓ de la longitud total del cuerpo, mide 0.52 mm. a 0.56 mm. de largo por 0.45 mm. a 0.48 mm. de ancho; presenta un estrangulamiento mediano bien nítido.

El orificio genital está situado en la región preecuatorial del cuerpo, juxtabifurcal, sobreponiéndose a la faringe; es musculoso, redondeado, mide 0.05 mm. a 0.10 mm. de diámetro. La bolsa del cirro es pequeña, piriforme, mide 0.09 mm. a 0.12 mm. de largo por 0.03 mm. a 0.05 mm. de ancho. El testículo es único, mediano, grande, mide 0.24 mm. a 0.28 mm. de largo por 0.20 mm. a 0.28 mm. de ancho, está situado a nivel de la zona ecuatorial del cuerpo.

El ovario es de tamaño menor que el testículo, está situado en posición lateral, a la derecha de la línea media, bien por debajo de la terminación de los ciegos intestinales, es redondeado, midiendo 0.03 mm. de diámetro. La glándula de Mehlis es pequeña, juxtaovárica. Las glándulas vitelógenas son pequeñas, formadas por folículos bien compactos; están situadas por debajo de la terminación de los ciegos intestinales, pero no contactando con el acetábulo. El útero es largo, ocupa el extremo posterior del cuerpo, para luego hacerse intracecal.

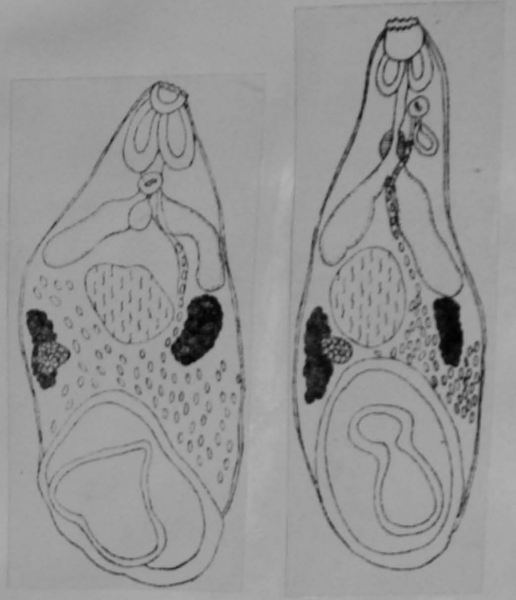
Los huevos son numerosos, miden 0.071 mm. a 0.088 mm. de largo por 0.029 mm. a 0.044 mm. de ancho.

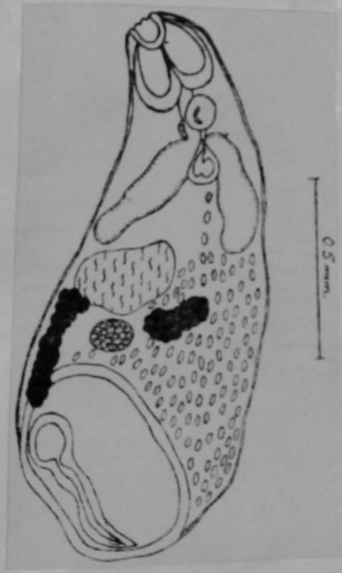
El aparato excretor tiene su orificio en el extremo posterior del cuerpo, presenta una vesícula excretora mediana y pequeña.

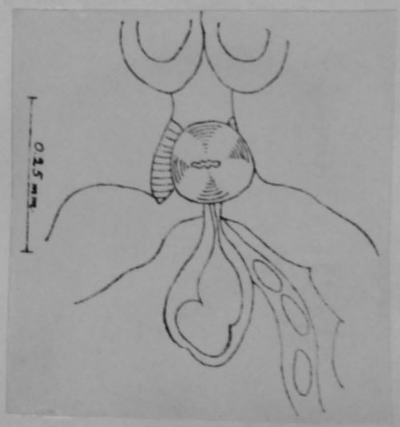
Habitat: Intestino recto de *Liophis miliaris* (L.).

Procedencia: Bañado Tropa Vieja, Departamento de Canelones, Uruguay, 3 ejemplares depositados en la colección helmintológica del Museo Nacional de Historia Natural de Montevideo.

Discusión: Identificamos nuestros ejemplares como pertenecientes a la especie *Catadiscus dolichocotyle* COHN, 1913, descrita por su autor del intestino grueso de *Chironius fuscus* (L.), valiéndonos para ello de la traducción de la descripción original hecha por FREITAS y LENT, 1939. Efectivamente, los ejemplares examinados presentan la misma disposición postcecal de los vitelógenos, el testículo grande, mucho mayor que el ovario; los huevos de tamaño sensiblemente iguales, los caracteres de forma y proporción del acetábulo, así como la proporción entre la ventosa oral y los divertículos. Se diferencia claramente de *C. cohni* TRAVASSOS, 1921, por la disposición de los vitelógenos y por el testículo, que es de tamaño similar al ovario. De *C. pygmaeus* (LUTZ, 1928), se diferencia por la disposición cecal de la parte anterior de los vitelógenos, acetábulo pequeño, menor a ⅓ con relación a la longitud del cuerpo.







— OVER —

La otra especie del género Catadiscus que parasita ofidios es *C. freitaslenti* Ruiz, 1943, procedente del intestino delgado de *Liophis miliaris* (L.), descrita posteriormente por Lent, Freitas y Provenca, del intestino grueso de *Bufo paracnemis* Lutz y *Leptodactylus ocellatus* (L.), procedente de Isla Valle y Chaco-i, Paraguay. Si bien esta especie presenta huevos de tamaño similar, aunque algo mayores, testículo mucho mayor que el ovario, se diferencia de *C. dolichocotyle* por el reducido tamaño de los divertículos bucales, así como en la disposición de los vitelógenos que ocupan en *C. freitaslenti* una posición cecal y postcecal.

From Mañé-Garzón and Gortari, 1965

Mañé-Garzón, 1958

CATADISCUS CORDEROI n. sp.
(PLANCHE I)

Dimensions en mm. (0.00)

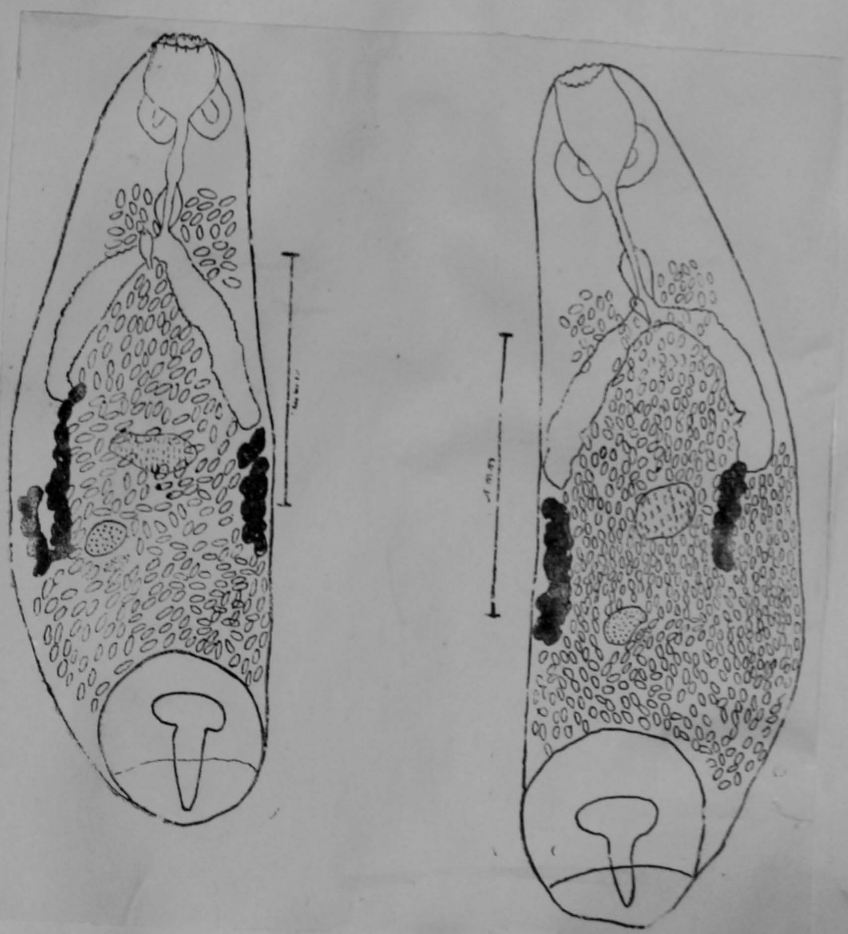
Longeur totale	3.11
Longeur maximum	0.94
Ventouse ovale	
longeur	0.31
largeur	0.21
Diverticules pharyngiens	
longeur	0.14
largeur	0.13

1763—MAÑÉ-GARZÓN, F., 1958. "Un nouveau trématode des batraciens de l'Uruguay: *Catadiscus corderoi* n.sp." **Comunicaciones Zoológicas del Museo de Historia Natural de Montevideo, 4** (78), 1–3.

A new amphistome, *Catadiscus corderoi* n.sp. is described from *Pseudis meridionalis*. *C. corderoi* is separated from other species of the genus *Catadiscus* as it is relatively large and has uterine coils which extend in front of the intestinal bifurcation and comparatively small eggs (less than 70 μ long).

M. Beverley-Burton

Prépharynx	0,22
Pharynx	
longeur	0,14
largeur	0,08
Caeca	0,72
Testicule	
largeur	0,12
longeur	0,18
Ovaire	
largeur	0,12
longeur	0,06
Acetabulum	
longeur	0,70
largeur	0,39
Cirhe	
longeur	0,07
largeur	0,09
Oeufs	
longeur	0,06/0.057
largeur	0,03/0,02



OVER

Corps subpiriforme, trois fois plus long que large, cuticule lisse. La ventouse orale terminale, avec son rebord finement ondulé, presente des diverticules saillants, plus courts que le prépharinx; celui-ci est court et grêle. Le pharynx, une fois plus court que le prépharynx, est bien marqué et musclé; esophage nul. La bifurcation caecale se trouve placée par devant l'équateur, au niveau du 1|5 - 1|6 antérieur du corps. Caeca courts mais larges, légéréments obliques en relation à l'axe longitudina', se terminant au niveau de l'équateur du corps. Acetabulum subterminal, grand et fort, représentant un quart de la longeur totale du corps; il présente un étranglement médian trés peu accentué. Orifice génital, préequatorial, juxta bifurcal.

Poche du cirrhe petite assez difficile á trouver. Le testicule, impair, médian, à grand axe transversal, est aussi difficile à limiter d'entre les oeufs; il est placé juste au dessous de la terminaison des caeca intestinaux. L'ovaire légérement lateral, deux fois plus petit qui le testicule, est presque ovale. Glande de Mehlis juxta ovarienne.

Les glandes vitellogénes formés de follicules trés peu nombreux, s'étendent de l'extrémité posterieure des caeca intestinaux jusqu'au niveau de la zone ovarique, restant toujours assez éloigués de l'acetabulum. L'utérus est dorsal occupant dans son ensemble la plus grande partie du corps; en arriére il atteint le bord antérieur de l'acetabulum, latéralement il reste limité par les vitellogénes et les caeca intestinaux, C'est par devant qu'il depasse les caeca pour se placer aux côtés du pharynx dont ils atteignent la limite antérieure.

Oeufs très nombreux, petits, une fois plus longs que larges, operculés. Systéme linphatique présent.

Habitat. Intestin terminal de *Pseudis meridionalis*, Miranda - Ribeiro 2 examplaires. Uraga col. x leg. 15.IV.58. Col. M. H. N.

Posterierieurement j'ai observé deux nouveaux examplaires in vivo, confirment la position prebifurcale des anses uterines.

Discussion. Cette nouvelle espece se distingue des autres especes déjà décrites du genre Catadiscus par ses dimensions relativement grandes, par la petitesse des oeufs et par la disposition des anses uterines par devant la bifurcation caecale.

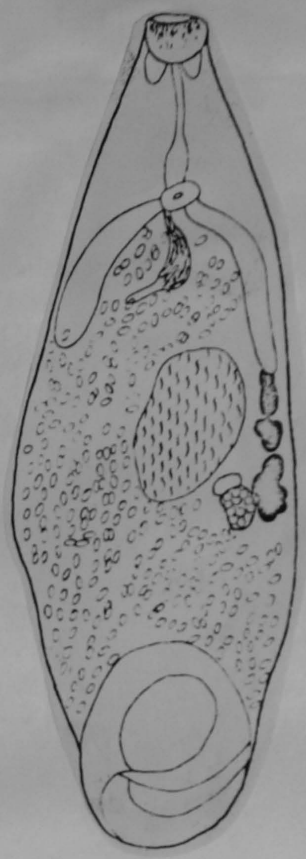
D'accord avec J. F. Teixeira de Freitas, je propose le complèment suivant à la clef publiée par Dobbin (1957)

5. Oeufs de plus de 0.070 de lengeur
–. Oeufs de moins de 0.070 de longeur C. corderoi n. sp.

5a Vitellogènes atteignant la zone caecale, surpassant la zone testiculaire antérienr et postérieurement C. inopinatus Freitas, 1941.

–. Viteilogènos qui n'atteignent pas la zone caecale, postérieurs à la zone testiculaire C. mirandai Freitas, 1943.

Catadiscus eldoradiensis n. sp. Artigas, Toledo, and Perez, 1964



Trata-se de um trematódeo pequeno, brancacento, pouco espêsso, de cutícula lisa. Ventosa oral relativamente pequena e provida de dois divertículos. Pré-faringe delgada. Faringe pouco desenvolvida, de situação pré-cecal. Esôfago praticamente nulo. Cecos curtos, não atingindo o plano mediano do corpo. Testículo único, volumoso, situado no plano equatorial, num campo parcialmente deslocado da linha mediana. Bôlsa do cirro bem desenvolvida. Ovário e glândula de Mehlis contíguos, situados os dois órgãos no campo testicular, em zona imediatamente posterior, colocados paramedialmente. Vitelinos em grandes massas foliculares, em número reduzido, situados na mesma zona testicular e em campo lateral, à esquerda. Poro genital disposto na zona da bifurcação dos cecos. Alças uterinas numerosas, os ovos se distribuindo em tôda a área do corpo situada entre os cecos até a extremidade posterior do corpo; ovos numerosos e operculados. Ventosa posterior potente, grande, terminal, na extremidade posterior e com uma prega ou espessamento bem observado em um dos exemplares examinados.

Trata-se, evidentemente, de um trematódeo paramfistomídeo que apresenta as características gerais do *Catadiscus* e que poderia ser classificado como *C. cohni* Trav., 1926., não fôsse a curiosa circunstância de apresentar a massa vitelínica unilateral, aparentemente um complexo ímpar de glândulas vitelogênicas.

O fato de havermos encontrado o trematódeo em tela em dois hospedeiros, embora da mesma espécie, mas provenientes de lugares distantes (Eldorado Paulista, que ainda há poucos anos tinha a denominação de Xiririca, dista da capital do Estado cêrca de 250 quilômetros) e a circunstância dos oito exemplares possuirem morfologia nitidamente superponível, parecem-nos elementos suficientes para erigir uma nova espécie bem definida de *Catadiscus*.

No seguinte quadro relatamos as medidas de quatro helmintos, tomadas após coloração pelo carmim e montagem em bálsamo.

	Exemplares do lote 562			Exemplar do lote 666
Comprimento	3,00 mm	2,24 mm	2,16 mm	2,50 mm
Largura máxima	1,00 mm	0,80 mm	1,04 mm	1,00 mm
Ventosa oral	180 × 250 μ	—	100 × 160 μ	—
Divertículo da ventosa oral	120 × 120 μ	100 × 100 μ	130 × 100 μ	—
Pré-faringe	250 μ	—	340 μ	—
Faringe	180 × 100 μ	200 × 180 μ	130 × 100 μ	180 × 130 μ
Cecos	800 × 100 μ 620 × 120 μ	610 × 120 μ 640 × 130 μ	690 × 160 μ 670 × 130 μ	510 × 180 μ 500 × 160 μ
Testículo	600 × 400 μ	460 × 410 μ	550 × 350 μ	350 × 220 μ
Bôlsa do cirro	420 × 120 μ	160 × 110 μ	—	—
Ovário	100 × 80 μ	—	—	200 × 140 μ
Glândula de Mehlis	90 × 60 μ	—	—	—
Acetábulo	750 × 630 μ	600 × 650 μ	600 × 560 μ	600 × 870 μ
Folículos vitelínicos	100 × 80 μ	—	—	83 × 63 μ
Ovos (média de 10)	74 × 30 μ	82 × 31 μ	60 × 32 μ	62 × 32 μ

A disposição dos vitelinos nas espécies do gênero *Cataditscus* não é uniforme: *C. dolichotyle*, *C. pygmaeus*, *C. uruguayensis*, *C. inopinatus*, *C. mirandai* e *C. freitasienti* apresentam dois grupos simétricos de glândulas. *C. marinholutzi* e *C. propinquus* apresentam os vitelinos dispostos em faixa transversal. No caso vertente de *C. eldoradiensis* n. sp., os vitelinos, cuja disposição é o elemento diferencial específico, se dispõe unilateralmente.

Hospedeiro: *Leptodactylus ocellatus*

Habitat parasitário: Intestino delgado.

Proveniência: *Eldorado Paulista* (SP), antiga Xiririca (localidade tipo) e São Paulo (SP), Brasil.

O material que se utilizou no presente trabalho acha-se depositado na coleção helmintológica do Departamento de Parasitologia da Faculdade de Farmácia e Bioquímica da Universidade de São Paulo, sob os números 562 e 666.

De Freitas & Lent, 1938 Paramphistomidae

Cataditcus marinholutzi n. sp.

Figura 10 a 14

Corpo subpiriforme, medindo 1,61 a 2,49 mm. de comprimento por 1,05 a 1,29 mm. de maior largura. Cutícula lisa. Ventosa oral terminal, provida de diverticulos mais ou menos desenvolvidos, menores em comprimento que o prefaringe, e medindo 0,08 a 0,10 mm. de comprimento sem os diverticulos e 0,20 a 0,25 mm. com êstes. A largura medida ao nivel dos diverticulos é de 0,18 a 0,22 mm. Prefaringe mais ou menos delgado, com 0,28 a 0,33 mm. de comprimento. Faringe musculoso, com 0,15 a 0,18 mm. de comprimento por 0,06 a 0,10 mm. de largura. Esôfago quasi nulo. Cecos mais ou menos longos, obliquos, terminando quasi ao nivel do equador do corpo. Acetábulo sub-terminal, com 0,70 a 0,90 mm. de comprimento por 0,53 a 0,98 mm. de largura, apresentando um estrangulamento mediano, transversal, relativamente pouco desenvolvido. Poro genital preequatorial, mediano, bifurcal. Bolsa do cirro bem desenvolvida, geralmente globosa, com 0,15 a 0,18 mm. de comprimento por 0,17 a 0,25 mm. de largura. Testículo único, mais ou menos deslocado para o lado, de forma variavel, situado no fim da zona cecal ou logo abaixo dela, medindo 0,28 a 0,53 mm. de comprimento por 0,33 a 0,55 mm.. de largura. Ovário geralmente mediano, com zona e campo superpondo-se ou não com os do testículo, comumente arredondado, medindo 0,10 a 0,17 mm. de comprimento por 0,12 a 0,15 mm. de largura. Glândula de Mehlis post-equatorial, com campo e zona mais ou menos superpostos aos do ovário, às vezes fortemente desenvolvida, outras vezes dificilmente visivel. Vitelinos constituidos por foliculos muito grandes, situados lateralmente e atravessando o corpo pelo lado dorsal logo abaixo da bifurcação do esôfago, extendendo-se, portanto, da zona acetabular ou preacetabular à zona postbifurcal. Útero dorsal, ocupando toda a largura do corpo, indo da zona bifurcal até a extremidade posterior do corpo. Ovos operculados, grandes, com 0,113 a 0,126 mm. de comprimento por 0,059 a 0,071 mm. de largura. Sistema limfático presente, complexo.

Habitat — Intestino delgado e grosso de *Leptodactylus ocellatus* (L.) (hospedador tipo) e *Leptodactylus caliginosus* (Gir.).

Proveniência — Camisão (localidade typo) e Salôbra, Estado de Mato Grosso — Brasil.

Tipos e cotipos na coleção helmintológica do Instituto Oswaldo Cruz.

Examinamos 35 exemplares, dos quais 8 foram medidos. Observamos um exemplar com atrofia do testículo. E' esta especie facilmente separada da espécie tipo e da de Travassos pelas maiores

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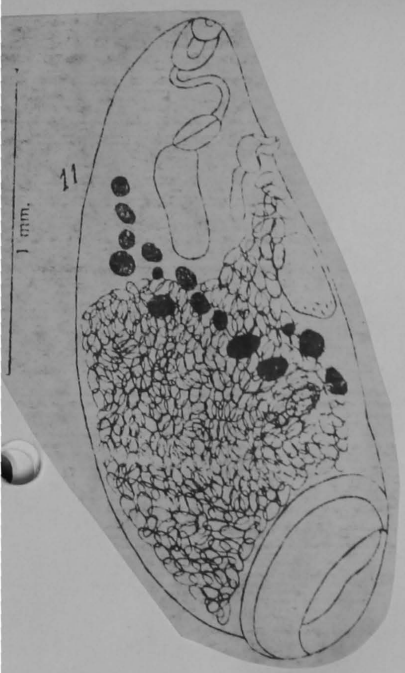
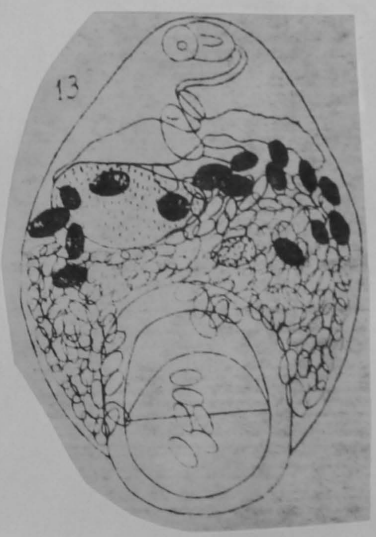




dimensões dos ovos, carater êste que a aproxima de *C. uruguayensis* n. sp., da qual, entretanto, se distingue por outros caráteres. O desenvolvimento dos vitelinos e a sua disposição, atingindo a região post-bifurcal, a tornam bastante característica.

Dedicamô-la ao Major Marinho Lutz, Diretor da Estrada de Ferro Noroeste do Brasil, que tanto facilitou nossa excursão ao Estado de Mato Grosso.

Paramphistomidae
at

De Freitas & Lent, 1938

Cataldiscus pygmaeus (Lutz, 1928) ~~n. comb.~~

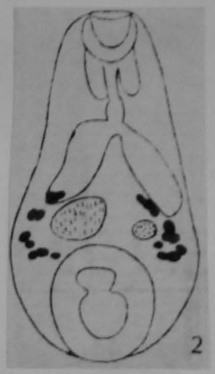
Figura 2

Diplodiscus pygmaeus Lutz, 1928, pp. 102-103, est. 24, figs 5-6.
Diplodiscus pygmaeus Travassos, 1934, p. 98.
Diplodiscus pygmaeus Walton, 1938, p. 30.

Corpo subpiriforme, com 1,04 mm. de comprimento por 0,60 mm. de maior largura. Cutícula lisa. Ventosa oral terminal, com bôca circundada por pequenas papilas e provida de diverticulos grandes, quasi do comprimento do prefaringe, e medindo 0,12 mm. de comprimento por 0,176 mm. de largura, sendo que os diverticulos têm 0,096 mm. de comprimento. Prefaringe com 0,13 mm. de comprimento. Faringe musculoso, com 0,072 mm. de diâmetro. Esófago praticamente nulo. Cecos mais ou menos obliquos, longos, com 0,26 mm. de comprimento, terminando logo abaixo do equador do corpo. Acetábulo subterminal, com um espessamento transversal, medindo 0,35 mm. de comprimento por 0,32 mm. de largura. Testiculo único, levemente afastado para o lado, com 0,16 mm. de comprimento por 0,21mm. de largura, situado em parte na zona e no campo cecais. Ovário mais ou menos arredondado, com 0,056 mm. de comprimento por 0,080 mm. de largura, deslocado lateralmente, situado na zona testicular, porém com campo afastado do do testículo. Vitelinos constituidos por foliculos pouco numerosos, mais ou menos desenvolvidos, situados lateralmente, extendendo-se da zona testicular à zona acetabular. Utero dorsal, com poucos ovos de casca fina, que medem 0,080 a 0,088 mm. de comprimento por 0,056 mm. de largura. Sistema linfático complexo.

Habitat — Recto de *Pseudis paradoxa* (L.).

Distribuição geográfica — Venezuela.



Espécie muito proxima de *C. cohni* Trav., 1926, com a qual talvez possa ser identificada após estudo de material mais recente. Examinamos os exemplares do Prof. A. Lutz, a quem somos gratos, que estão relativamente mal conservados. Êstes mesmos exemplares já haviam sido examinados pelo Prof. Travassos que verificára pertencer a espécie ao gênero *Cataldiscus*. A descrição que damos é feita de acôrdo com as medidas já realizadas por Travassos, assim como também é dêle o desenho que agora publicamos.

Um único exemplar do material de Lutz contém ovos, que são muito semelhantes aos de *C. cohni*, somente um pouco mais largos. Os demais órgãos se assemelham muito aos desta espécie, excetuando o acetábulo que é sensivelmente menor.

Paramphistomidae

at

De Freitas & Lent, 1938

Cataditcus uruguayensis ~~n. sp.~~

Figuras de 15 a 20

Corpo subpiriforme, medindo 0,96 a 2,16 mm. de comprimento por 0,45 a 0,71 mm. de maior largura. Cuticula lisa. Ventosa oral terminal, com boca de rebordo levemente ondulado, provida de diverticulos grandes e medindo 0,10 a 0,13 mm. de comprimento sem eles e 0,18 a 0,23 mm. com eles. A largura ao nivel dos diverticulos é de 0,13 a 0,22 mm. Prefaringe com 0,22 a 0,23 mm. de comprimento. Faringe musculoso, com 0,07 a 0,12 mm. de comprimento por 0,05 a 0,10 mm. de largura. Esôfago quasi nulo. Cecos mais ou menos obliquos, terminando acima do equador do corpo. Acetábulo subterminal, com 0,40 a 0,61 mm. de comprimento por 0,31 a 0,56 mm. de largura, com um estrangulamento transversal mediano mais ou menos desenvolvido. Poro genital preequatorial, mediano, bifurcal. Bolsa do cirro bem desenvolvida, com 0,10 a 0,15 mm. de comprimento por 0,03 a 0,07 mm. de largura. Testiculo único, geralmente deslocado para um dos lados do corpo, de forma variavel, situado no fim da zona cecal ou logo abaixo dela, medindo 0,10 a 0,25 mm. de comprimento por 0,15 a 0,28 mm. de largura. Ovário arredondado ou alongado, geralmente deslocado para o lado, mais ou menos afastado do testiculo, com campo e zona ás vezes em contacto com os do testiculo, medindo 0,08 a 0,17 mm. de comprimento por 0,07 a 0,08 mm. de largura. Glandula de Mehlis bem desenvolvida, próxima ao ovário, com 0,07 a 0,10 mm. de comprimento por 0,05 a 0,07 mm. de largura. Vitelinos constituidos por folículos pouco numerosos e pouco desenvolvidos, situados lateralmente, extendendo-se da zona testicular à zona da glandula de Mehlis. Útero dorsal, da zona bifurcal à zona acetabular. Ovos operculados, grandes, com 0,105 a 0,113 mm. de comprimento por 0,053 a 0,055 mm. de largura. Sistema limfático complexo.

Habitat — Intestino delgado e grosso de *Leptodactylus ocellatus* (L.)

Proveniência — Montevideo, Uruguai.

Tipos e cotipos na coleção helmintológica do Instituto Oswaldo Cruz.

Desta espécie examinamos 22 exemplares, graças à gentileza do Prof. Miguel Ozorio de Almeida e seus assistentes que nos forneceram as visceras das rãs trazidas de Montevideo por aquele professor.

Pelas dimensões dos ovos é próxima de *C. marinholutzi* n. sp., da qual facilmente se distingue pelo tamanho e disposição dos vitelinos. Aproxima-se de *C. dolichocotyle*, da qual se diferencia pelos ovos de comprimento maior.

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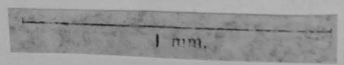


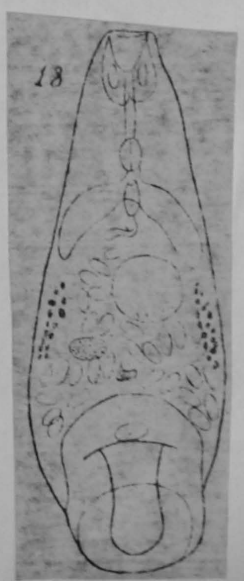
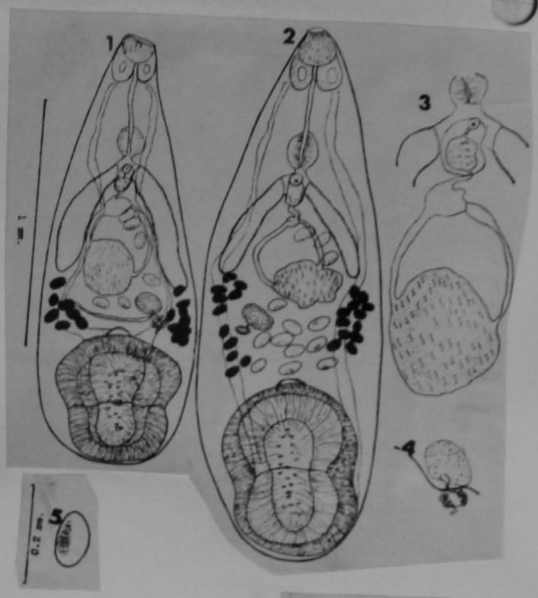
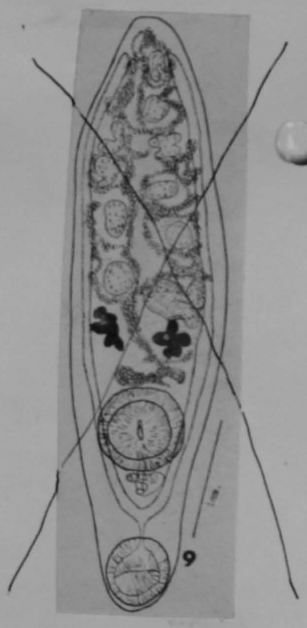


Tabla comparativa de medidas (en milímetros) de « Catadiscus uruguayensis » de la provincia de Buenos Aires, República Argentina y « Catadiscus uruguayensis » de Uruguay.

	Catadiscus uruguayensis República Argentina	*Catadiscus uruguayensis* Uruguay
Largo	0.99-2.10	0.96-2.16
Ancho	0.48-0.88	0·45-0.71
Ventosa oral con divertíc.	0.19-0.39	0.18-0.23
Ventosa oral sin divertíc.	0.10-0.19	0.10-0.13
Prefaringe	0.21-0.24	0.22-0.23
Faringe	0.072-0.16 × 0.075-0.14	0.07-0.12 × 0.05-0.10
Acetábulo	0.46-0.67 × 0.39-0.54	0.40-0.61 × 0.31-0.56
Relación entre el largo del cuerpo y largo del acet.	1 : 2.1-1 : 3.2	1 : 2.4-1 : 3.5
Testículos	0.14-0.28 × 0.15-0.28	0.10-0.25 × 0.15-0.28
Bolsa del cirro	0.13 × 0.020	0.10-0.15 × 0.03-0.07
Ovario	0.065-0.16 × 0.078-0.13	0.08-0.17 × 0.07-0.08
Huevos	0.072-0.100 × 0.042-0.050	0.105-0.113 × 0.053-0.055
(1)		0.084-0.112 × 0.036-0.056

(1) Medidas tomadas de los ejemplares del preparado nº 10543 de Teixeira de





CATADISCUS

Dermatemytrematinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Paramphistomidae: Body pyriform or conical. Oral sucker with diverticula, esophagus long, with posterior bulb. Acetabulum large, constricted on each side near posterior end, with trifoliate opening. Testes single, submedian. Ductus ejaculatorius and metraterm enclosed in ovoid hermaphroditic pouch. Genital pore prebifurcal; a prominent genital papilla is formed when the hermaphroditic pouch is contracted. Ovary median, pre-acetabular. Uterus intercecal. Vitellaria forming a transverse band across the body in front of acetabulum. Lymph system with two pairs of longitudinal stems. Parasites of turtles.

Dermatemytrema Price, 1937

Generic diagnosis. — Paramphistomidae, Dermatemytrematinae: Body pyriform or conical, with indistinct ridge-like collar near anterior end. Oral diverticles moderately developed. Acetabulum large, terminal, with ventral opening somewhat trifoliate. Esophagus long, with posterior bulb; ceca terminating in front of acetabulum. Testes single, submedian, postequatorial. Seminal vesicle tubular, winding behind intestinal bifurcation. Ductus ejaculatorius and metraterm enclosed in a dense ovoid hermaphroditic pouch. Genital pore prebifurcal, may be protruded in form of a papilla. Ovary median, pre-acetabular, posttesticular. Laurer's canal opening anterior to excretory pore. Uterus slightly tortuous in median intercecal field; eggs few, very large. Vitelline follicles large, few in number, forming pre-acetabular band across body, tending to be grouped behind cecal ends. Excretory pore at level of anterior end of acetabulum. Lymph system consisting of 2 pairs of longitudinal canals, one pair dorsal and the other ventral to ceca. Parasites of turtles.

Genotype: *D. trifoliatum* Price, 1937 (Pl. 59, Fig. 721), in intestine of *Dermatemys mawii;* Mexico.

Dermatemytrema, n. gen. Price, 1937

Diagnosis.—Body piriform, with indistinct ridge-like collar near anterior end. Oral diverticula moderately developed. Acetabulum large, somewhat trifoliate. Lymph system consisting of 2 pairs of longitudinal canals, one pair dorsal and the other ventral to intestinal ceca. Genital aperture anterior to intestinal bifurcation. Testis single, lateral. Ovary median; vitellaria consisting of relatively few large follicles forming preacetabular band across body. Laurer's canal present, opening anterior to excretory aperture.

Type species.—Dermatemytrema trifoliata, n. sp.

The genera of the subfamily Diplodiscinae may be separated by the following key:

1.	Acetabulum with small central accessory sucker	2
	Acetabulum without accessory sucker	4
2.	Adults with 2 testes	Megalodiscus Chandler
	Adults with 1 testis	3
3.	Esophageal bulb present	Diplodiscus Diesing
	Esophageal bulb absent	Opisthodiscus Cohn
4.	Testis median; acetabulum divided	Catadiscus Cohn
	Testis lateral; acetabulum not divided	Dermatemytrema n. g.

Dermatemytrema, Price, 1937

Generic diagnosis: Body piriform, with indistinct ridge-like collar near anterior end. Oral diverticula moderately developed. Acetabulum large, somewhat trifoliate. Lymph system consisting of 2 pairs of longitudinal canal, one pair dorsal and the other ventral to intestinal ceca. Genital aperture anterior to intestinal bifurcation. Testis single, lateral. Ovary median; vitellaria consisting of relatively few large follicles forming preacetabular band across body. Laurer's canal present, opening anterior to excretory aperture.

Type species.--Dermatemytrema trifoliata, Price, 1937. in turtle; Mexico.

The genera of the subfamily Diplodiscinae may be separated by the following key:

1. Acetabulum with small central accessory sucker — 2
   Acetabulum without accesory sucker — 4

2. Adults with 2 testes — Megalodiscus Chandler
   Adults with 1 testis — 3

3. Esophageal bulb present — Diplodiscus Diesing
   Esophageal bulb absent — Opisthodiscus Cohn

4. Testis median; acetabulum divided — Catadiscus Cohn
   Testis lateral; acetabulum not divided — Dermatemytrema Price

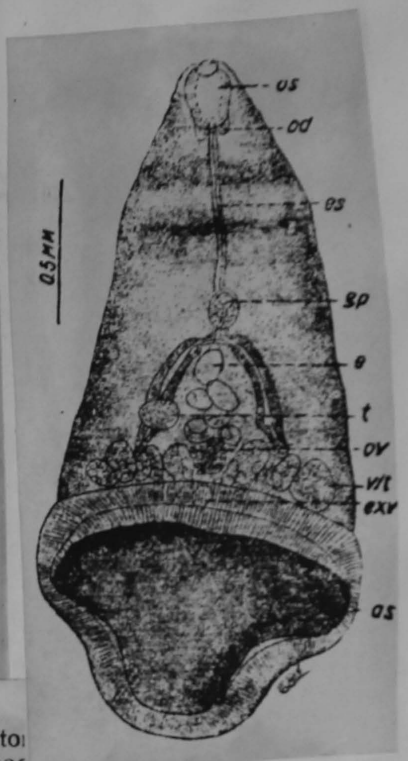
FAMILY PARAMPHISTOMIDAE FISCHOEDER 1901

Subfamily Diplodiscinae Cohn 1904

Dermatemytrema trifoliata n. gen., n. sp. Price, 1937

Figs. 1–2

Description.—Body 2,2 to 2,5 mm long by 1 to 1 mm wide at level of anterior margin of acetabulum, elliptical in cross section, and with a low ridge-like collar about midway between base of oral sucker and genital aperture. Oral sucker terminal, 255 μ long by 170 to 200 μ wide, with short posterodorsally directed diverticula; acetabulum somewhat trifoliate in outline, 850 μ long by 1,2 mm. wide, opening ventrally. Esophagus 510 to 595 μ long; esophageal bulb about 100 μ in diameter; intestinal ceca short thick walled, terminating at level of ovary. Excretory aperture dorsal, at level of anterior rim of acetabulum; excretory vesicle piriform, with two branches curving laterally around ends of intestinal ceca and extending anteriorly in a slightly sinuous manner in extracecal fields. Lymph system consisting of 2 pairs of longitudinal canals, 1 pair dorsal and the other ventral to intestinal ceca; dorsal canals extending from near anterior end of body to acetabulum, here each canal bifurcating and sending secondary branches to acetabulum, ventral canals shorter than dorsal canals, extending from vicinity of genital aperture to level of ovary or slightly posterior to this. Genital aperture median, anterior to intestinal bifurcation, about 765 to 850 μ from anterior end of body; genital sinus small; ejaculatory duct and terminal portion of uterus surrounded by a more or less dense, ovoid mass of tissue about 170 μ long by 85 to 120 μ wide. Testis single (entirely absent in majority of specimens), about 85 μ in diameter, ventral to right intestinal cecum and a short distance anterior to right group of vitelline follicles. Ovary median, oval, 120 to 170 μ long by about 100 μ wide, slightly preacetabular. Mehlis' gland well developed



dorsal to ovary; Laurer's canal relatively long, opening anterior to excretory aperture. Vitelline follicles large, few in number, forming band across body immediately preacetabular. Uterus slightly tortuous, in median field. Eggs oval, about 160 μ long by 88 μ wide.

Host.—Dermatemys mawii Gray.

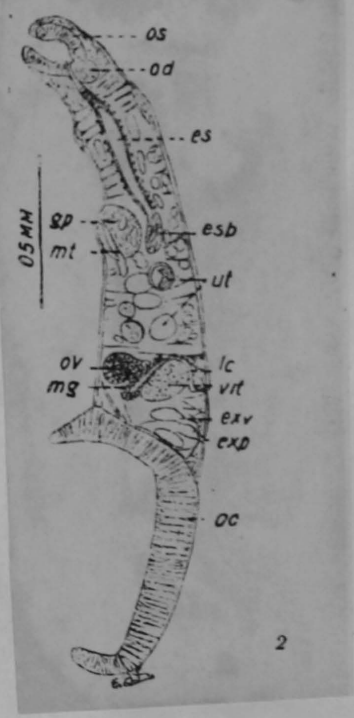
Location.—Stomach.

Distribution.—Tehuantepec, Mexico.

Specimens.—U. S. National Museum Helm. Coll. No. 25458 (type and paratypes).

Numerous specimens of this fluke were collected from a single turtle on October 12, 1923, by Dr. E. A. Chapin. All of the specimens showed the same degree of maturity and probably represented a simultaneous infection. A striking peculiarity of this fluke is the absence of the testis in most of the individuals. In all about 20 specimens were examined, either in sections or as toto mounts, and in only 2 specimens was any trace of a testis found.

The inclusion of this form in the subfamily Diplodiscinae is mainly because of its resemblance to the genus Catadiscus Cohn. Its similarity to this genus is largely in the distribution of vitelline follicles and in having a single



testis. The acetabulum is not divided as in Catadiscus but its shape suggests a tendency toward such a division. In addition to the shape of the acetabulum, it differs from Catadiscus in having the genital aperture anterior to the intestinal bifurcation, in the lateral position of the testis, and in having 2 pairs of longitudinal lymph canals instead of 4 pairs as in that genus. The genus may be tentatively defined as follows:

—OVER—

Dermatemytrema trifoliatum Price, 1937

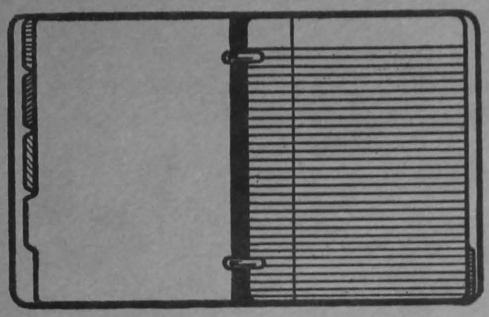
Host.—*Dermatemys mawii*.
Site.—Lower intestinal tract.
Geographic range.—Tabasco, Mexico.

In describing this species, Price (1937) did not identify the state in Mexico from which the host came. In the present study, a single specimen, which is undoubtedly conspecific with Price's material was recovered from a mixed infection of hundreds of other amphistomes and angiodictyids. The specimen is about 2 mm long, and it has the general body proportions given by Price in the original description. It also has the large acetabulum with the trifoliate aperture which served as the basis for the specific name.

FROM THATCHER, 1963

DERMATEMYTREMA

LOOSE LEAF INDEX



DURABLE INDEX DIVIDERS, SUITABLE FOR SCHOOL OR COMMERCIAL USE.

IDEAL FOR CLASSIFYING, OR SEPARATING STUDIES, VARIOUS SUBJECTS OR MISCELLANEOUS DATA.

Name _____ Telephone _____

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SUBJECTS

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CLASS SCHEDULE

PERIOD		FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SEVENTH	EIGHTH
MONDAY	COURSE								
	INSTRUCTOR								
TUESDAY	COURSE								
	INSTRUCTOR								
WEDNESDAY	COURSE								
	INSTRUCTOR								
THURSDAY	COURSE								
	INSTRUCTOR								
FRIDAY	COURSE								
	INSTRUCTOR								
SATURDAY	COURSE								
	INSTRUCTOR								

This subfamily was founded in 1904 by Cohn to include the three

Key to subfamilies of Paramphistomidae from amphibians

Body conical; acetabulum very large; testes usually single Diplodiscinae
Body subcylindrical; acetabulum not very large; testes double
..... Pseudochiorchiinae

Diplodiscinae Cohn, 1904

Subfamily diagnosis. — Paramphistomidae: Body more or less conical. Acetabulum ventroterminal, large, with or without central prominence, which may assume a sucker-like appearance. Oral sucker with paired diverticula. Esophagus with bulb. Ceca long or short. Testes single, occasionally double, usually in middle third of body. Cirrus pouch small. Genital pore median, usually postbifurcal. Ovary usually submedian, posttesticular. Vitellaria extending along ceca or grouped at or behind cecal ends. Uterine coils usually intercecal, occasionally more extensive. Excretory pore anterior or dorsal to acetabulum. Lymph system with one pair or two of longitudinal stems.

Key to genera of Diplodiscinae from amphibians

1. Testes double 2
   Testes single 4
2. Acetabulum with sucker-like central projection 3
   Acetabulum extremely large, with central prominence but not central sucker; esophageal bulb present .... *Megalodiscus*
3. Esophageal bulb absent; vitellaria largely lateral and partly between two cecal ends ..... *Opisthodiscus*
   Esophageal bulb present; vitellaria confined to area medial to cecal ends ..... *Pseudopisthodiscus*
4. Acetabulum constricted into two portions, oral diverticles very prominent; ceca short; vitellaria largely postcecal; uterus extensive ..... *Catadiscus*
   Acetabulum simple, oral diverticles not very prominent; ceca longer; vitellaria largely lateral to ceca; uterus not extensive ..... *Diplodiscus*

Catadiscus is the only representative of this subfamily from reptiles.

Diplodiscus Diesing, 1936

Generic diagnosis. — See p. 374.

Representatives from fish hosts: *D. cornu* (Dies., 1839) Daday, 1907 (Pl. 29, Fig. 382), in *Doras* sp. (*Cataphractus vacu*); Rio Branco, Brazil.

This subfamily was founded in 1904 by Cohn to include the three

Fam. Hopkins 1932.

Subfamily : DIPLODISCINAE, Cohn, 1904.

Subfamily diagnosis : Body more or less conical. Acetabulum ventroterminal, large, with or without central prominence. Pharynx with paired diverticula. Oesophageal bulb present. Caeca long or short. Testes single or double. Genital pore median, postbifurcal or at intestinal bifurcation. Ovary submedian, posttesticular. Vitelline follicles extending along caeca and turning inwards at caecal ends.

Mukherjee and Chauhan, 1965

from Harwood, 1932

Diplodiscinae Cohn, 1904

This subfamily was founded in 1904 by Cohn to include the three genera *Diplodiscus*, *Opisthodiscus*, and *Catadiscus*. The history of the North American members of this group began somewhat previous to that time, for both Stafford and Leidy had reported the presence of *Diplodiscus subclavatus* in North American frogs. Stafford (1905) separated the North American form from the European and named it *Diplodiscus temperatus*. No other representatives of this group were described from North America until Chandler (1923) proposed the genus *Megalodiscus* for a new species that he discovered in the rectum of *Amphiuma means*. Millzner (1924) added *Megalodiscus ranophilus* from the rectum of the common leopard frog to Chandler's genus. Since that time some little doubt has been thrown on the validity of *Megalodiscus*, but no thorough discussion of the problem has been forthcoming. Chapin (1926) believed that *Megalodiscus ranophilus* was identical with *Diplodiscus temperatus*. Cort (1926) agreed with Chapin, and in addition stated his belief that *Megalodiscus* should be considered a synonym of *Diplodiscus*. Hunter (1930) placed *Megalodiscus americanus* in the genus *Diplodiscus*. On the other hand, Holl (1928a) expresses himself as follows: "The writer has not seen any specimens of *Megalodiscus*, but believes that future work will show that there are a number of species, belonging to this group, in North America." Poche (1926) listed *Megalodiscus* with the Diplodiscinae. Fukui (1929) rejected *Megalodiscus*, stating that the differences cited are not of generic value. He included *Diplodiscus temperatus*, however, with those forms having a single testis in contrast to those having two, and thereby confused the whole group. Neither in my own material nor in any available descriptions have I found any reference to *D. temperatus* having any tendency whatsoever toward fusion of the testes.

The foregoing account briefly indicates the uncertainty and disagreement that exist among investigators concerning the validity of *Megalodiscus*. A comparison of *Megalodiscus americanus* with other North American forms shows a striking resemblance. Thus *Diplodiscus temperatus* possesses the small sucker in the center of the acetabulum, although it is very inconspicuous in many adult specimens. The acetabulum, although relatively a smaller structure than in *Megalodiscus americanus*, is, nevertheless, as wide as or wider than the body. The testes are conspicuously smaller. In other respects the differences are very minor, and as the differences already pointed out are of specific rather than of generic value, there can be little doubt that these two forms are cogeneric. I agree with Chapin (1926) that *Megalodiscus ranophilus* Millzner is synonymous with *Diplodiscus temperatus* Stafford. *Diplodiscus intermedius* Hunter seems to be a valid species, in many respects intermediate between the above-mentioned forms.

Holl (1928a) has described a new species of this group from *Triturus viridescens*. Apparently the basis for including his form in the genus *Opisthodiscus* is the presence of a small sucker in the center of the acetabulum and the absence of black concretions in the excretory system. I have already shown that the first character is common to other North American forms of this group, while in my collection there exist examples of *Diplodiscus temperatus* with conspicuous granules in the excretory ducts, while other specimens lack these. On the other hand, Holl's description of *Opisthodiscus americanus* shows some important differences from *O. diplodiscoides*, the type species of *Opisthodiscus*. The type species lacks an esophageal bulb, the oral sucker and pharyngeal pockets are relatively extremely large, the intestinal ceca are asymmetrical, and the ovary is median and between the testes. Holl's species has none of these characters but is, on the other hand, similar to the other North American forms of the group that have been placed in the genera *Diplodiscus* and *Megalodiscus*. It therefore becomes necessary to transfer Holl's species to one of these two genera. Indeed, on comparing some specimens of *Opisthodiscus americanus*, which Doctor Holl kindly sent me, with some barely mature examples of *Diplodiscus temperatus*, which were taken from local frogs, I find it impossible to separate

The two forms

the two forms, and I therefore consider Holl's species to be identical with *Diplodiscus temperatus*.

It appears, from what has been said above, that all the American species of this group [*temperatus* Stafford (including *ranophilus* Millzner and *americanus* Holl), *americanus* Chandler, and *intermedius* Hunter] are cogeneric. If, however, these species be compared with *Diplodiscus subclavatus*, the type species of *Diplodiscus*, important differences appear. In *D. subclavatus* the testes are single except in very young specimens; the vitellaria extend in two groups from the pharyngeal region to the caudal end of the intestinal ceca; and the posterior sucker has a cavity in its center instead of a prominence with special musculature. In the North American forms there is never any indication of fusion of the testes; the vitellaria are arranged in two or four compact groups with the anterior follicles scarcely reaching the level of the anterior testis; and the posterior sucker has a prominence with special musculature. These seem to me to be rather fundamental differences and to justify the placing of the North American forms in a separate genus. The name *Megalodiscus* Chandler (1923), proposed for his species *americanus*, is available for these North American forms. *Diplodiscus temperatus* Stafford and *D. intermedius* Hunter become *Megalodiscus temperatus* (Stafford) and *M. intermedius* (Hunter), respectively. *Megalodiscus americanus* stands as the type species of the genus. *Opisthodiscus americanus* Holl and *Megalodiscus ranophilus* Millzner fall into synonymy with *M. temperatus*.

According to Fukui (1929) there are 6 species in this subfamily:

Diplodiscus subclavatus (Goeze)
D. americanus (Chandler)
D. cornu (Diesing)
D. temperatus Stafford
Opisthodiscus diplodiscoides Cohn
Catadiscus dolichocotyle Cohn

Cercariae of Diplodiscinae:

C. diplocotylea Pag. larva of D. subclavatus
C. gastrodisci aegyptiaci Tooss
C. inhabilis Cort
C. diastropha Cort
C. cortii O'Roke
C. indicae ~~XXI~~ Sewell
C. missouriensis McCoy
C. convoluta Faust
C. temperatus Krull & Price

The cercaria of allostoma parvum is probably identical with C. inhabilis & C. convoluta.

Diplodiscus Diesing, 1836

Generic diagnosis. — Paramphistomidae, Diplodiscinae: Body more or less conical, oculate or not. Acetabulum ventroterminal, simple, with central papilla. Oral diverticles not very prominent. Esophageal bulb present. Ceca wide, reaching to near acetabulum or not. Testes single (double in young individuals), equatorial or postequatorial, median or slightly out of median line. Vesicula seminalis externa and interna present. Cirrus pouch small, subglobular to elongate, enclosing seminal vesicle and ejaculatory duct. Genital atrium present. Genital pore median, about one third of body length from anterior extremity on a level with intestinal bifurcation or posterior to it. Ovary submedian, posttesticular. No receptaculum seminis. Vitelline follicles extending along ceca and turning inwards at cecal ends, occasionally postcecal. Uterine coils intercecal or extending further backwards occasionally. Excretory vesicle saccular, giving off at its anterior end paired collecting vessels, each of which turns back on itself near the anterior extremity and runs backward into the acetabulum to be divided into several terminal tubules; excretory pore dorsal, pre-acetabular. Parasitic in endgut of amphibians, rarely of fishes.

Genotype: ***D. subclavatus*** **(Pallas, 1760)** Dies., 1836 (Pl. 40, Fig. 496) in *Rana;* Germany. Also in other European amphibians such as *Hyla, Bufo, Leptodactylus, Dendrodryas, Pelophylax, Phyrne, Bombinator, Lissotriton.* ***Diplocotyle mutabile*** Dies., 1850 (*Diplodiscus diesingi* Fil., renamed) and ***Redia gracilis*** Fil. from *Planorbis nitidus* are probably larva of ***Diplodiscus subclavatus*** — de Filippi, 1854. For embryonic development see Glaessner (1910).

Other species:

D. amphichrus Tubangui, 1933, syn. *D. sinicus* Li, 1937 — Bravo (1941), in *Rana* spp.; Philippines. Also in ***Rana*** spp.; India, Manchuria, Korea. Cercaria develops in *Gyraulus prashadi;* Manila — Tubangui (1939).

D. amphichrus magnus Srivastava, 1934, in *Rana cyanophlyctis, R. tigrina;* India.

D. doyeri Ortlepp, 1926, in *Xenopus laevis* (clawed toad); S. Africa.

D. japonicus (Yamaguti, 1936), syn. *D. amphichrus japonicus* Y., in *Rana nigromaculata, R. rugosa* and *Megalobatrachus japonicus;* Japan. Also in *Rana limnocharis, R. rugulosa, Oeidozyga lima;* China.

Segmentina mica and *Planorbis compressus* reported by Takahashi (1927) as intermediate host for "*D. subclavatus*" of Japan; and *Anisus* (*Gyraulus*) *hiemantium* by Yamaguti (1940) for his "*D. amphichrus japonicus*".

D. megalochrus Johnston, 1912, in *Hyla aurea* and *Lymnodynastes peronii;* Australia.

D. mehrai Pande, 1937, in *Rana cyanophlyctis;* India. Also in *Bufo viridis;* India.

D. melanosticti Yamaguti et Mitunaga, 1943, in *Bufo melanostictus;* Formosa.

D. microchrus Johnston, 1912, syn. of *megalochrus* Johnston, 1912— Bravo, 1941, in *Hyla ewingii* and *Lymnodynastes tasmaniensis;* Australia.

D. sinicus Li, 1937; in frogs; China.

D. unguiculatus (Rud., 1819) Dies, 1836, in *Triton palustris;* Berlin

Genus : *Diplodiscus* Diesing, 1836.

Generic diagnosis : Body more or less conical. Acetabulum ventroterminal, simple with central papillae. Oral diverticula small. Oesophageal bulb present. Caeca wide terminating near anterior margin of acetabulum. Testes single, equatrial or postequatorial, usually median. Genital pore median at or below intestinal bifurcation. Ovary submedian, posttesticular. Vitelline follicles extending along caeca, turning inward at caecal terminus, sometimes post caecal. Parasites of amphibia rarely of fishes.

Type species : *D. subclavatus* (Pallas, 1760) Diesing, 1836.

This genus was placed under the subfamily Diplodiscinae by Cohn, 1904. This scheme was followed by Stiles and Goldberger, 1910, Stunkard, 1925, Fukui, 1929, Travassos, 1934, Näsmark, 1937, Skrjabin, 1949, and Yamaguti, 1958. However, Stiles and Goldberger included this subfamily under the family Paramphistomidae Fischoeder, 1901. Rest of the above mentioned workers shared the opinion expressed by these two workers, except Skrjabin, who placed it under a new family Diplodiscidae.

Mukherjee and Chauhan, 1963

Paramphistomidae

DIPLODISCUS Diesing

Diagnosis as emended by Hunter 1930

Diplodiscinae with terminal oral sucker from the distal end of which project two well defined pharyngeal pouches. Esophagus arises ventrally terminating in prominent, rather muscular esophageal bulb. Intestinal crura arising laterally from the bulb are prominent, symmetrical and unbranched. Genital pore opens ventrally in region of esophageal bulb. Ovary lies posterior to testes; vitellaria extend laterally and medianly in the posterior part of the body. Eggs large. Posterior group of vitellaria extend mediad behind Mehlis' gland. Posterior sucker prominent, usually wider than remainder of body; contains conical papilla which may or may not surround the excretory pore. Parasites in the rectum of amphibia.

Testis single in adult

Type species: Diplodiscus subclavatus (Goeze)

Other species:

D.temperatus Stafford, 1905
(= D.ranophilus (Millzner, 1924))
D. americanus (Chandler)
D. intermedius Hunter, 1930
D. cornu (Diesing, 1840) Daday, 1907

According to Fukui (1929) and Krull & Price ~~Harwood~~ (1932) D. megalochrus Johnston, 1912 and D. microchrus Johnston, 1912 are synonyms of D. subclavatus (Goeze)

Paramphistomidae

(Pallas, 1760) Diesing, 1836

DIPLODISCUS SUBCLAVATUS (~~GOEZE, 1782~~).

Ce distome a été trouvé dans l'intestion de *Rana ridibunda* de Sainte-Marie-du-Zit et de l'oued Bezirk. Ce trématode, déjà signalé en Tunisie, a une très large répartition dans tout l'ancien monde.

Nous avons trouvé la cercaire de ce distome dans un tube où sont conservés, pour leur observation, des *Planorbis philippii* de Monterosato, pêchés à diverses époques en novembre et décembre dans l'oued Bezirk.

Il est sans intérêt de décrire de nouveau cette belle cercaire connue sous le nom de *Cercaria diesingii*, Filippi 1854, ou *C. diplocotylea*, Pagenstecher 1857, et étudiée en même temps que le cycle évolutif de *Dipl. subclavatus* par A. Loos (1892). Cet auteur avait donné comme hôtes intermédiaires de ce distome : *Planorbis nitidus*, *P. vortex*, *P. rotundatus*, *P. spirorbis* et *P. contortus*. *P. philippii* serait donc à ajouter à cette énumération.

Comme il semble de règle chez les Amphistomes, les cercaires rejetées par les mollusques sont à un stade très avancé de leur évolution (chez *C. diesingii* tous les organes de l'adulte sont reconnaissables, les testicules et l'ovaire occupent leur place définitive) et sont émises en petites quantités et à de longs intervalles. En hiver, à Tunis, à la température du laboratoire (15 à 17°), mais dans des tubes placés dans un endroit ensoleillé quelques heures chaque jour (la température de l'eau des tubes peut alors atteindre 30°), l'émission des cercaires se fait à des intervalles de une à deux semaines. Le nombre des cercaires libérées est de 2 à 4 chaque fois. Leurs mouvements de natation ont une cadence peu rapide qui permet à l'œil de suivre les larges ondulations de la queue. L'enkystement ne tarde pas et paraît pouvoir se produire sans le secours d'un support solide ou bien l'adhérence entre le kyste et le support est très faible, car le kyste se montre parfaitement sphérique, et la moindre agitation du tube le met en suspension dans l'eau.

From Balozet and Callot, 1938

after Lühe
From Bravo-Hollis, 1941

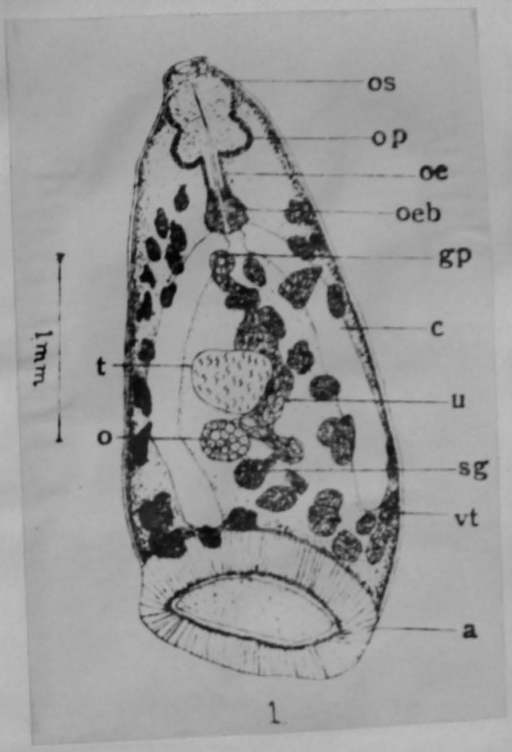
DIPLODISCUS AMPHICHRUS TUBANGUI, 1933.
(Fig. 1.).

Six specimens of this parasite were collected from the rectum of a frog, *Rana cyanophlyctis*. NEAR BAREILLY, INDIA

The worms are conical in shape with smooth cuticle. They measure 2.49-3.28(2.83) in length and 0.97-1.41(1.23) in maximum breadth. The maximum breadth occurs in front of acetabulum and at the level of caecal termination. The oral sucker is provided with oral pouches at the posterior end and the two together measure 0.42-0.58 (0.46) in length and 0.27-0.42(0.33) in maximum breadth. The distinct oesophagus measures 0.17-0.25 (0.20) in length and arises from the base of the oral sucker. It is provided with a distinct oesophageal bulb at the caecal bifurcation. The bulb measures 0.12-0.19(0.16) in length and 0.10-0.17(0.13) in breadth. The wide almost straight intestinal caeca extend upto the anterior margin of acetabulum. The acetabulum is well developed, muscular with small central sucker and measures 0.69-0.75 (0.73)×1.04-1.21(1.14). The unlobed almost rounded single testis is stituated in the middle of the body and measures 0.31-0.48 (0.38) in diameter. The genital pore is postbifurcal or at bifurcal zone.

The rounded ovary is situated posterior to testis and measures 0.14-0.23(0.19) in diameter. The large vitelline follicles extend almost from the region of oesophageal bulb to the anterior margin of acetabulum where the follicles of the two sides meet and after meeting they extend anteriorly to a short distance. The follicles are mostly extracaecal but at places they are intercaecal also. Uterus is intercaecal. The operculated eggs measure 0.11×0.06.

There are minor differences in *Diplodiscus amphichrus* var. *magnus* Srivastava (1934), *D. amphichrus japonicus* n. sub-sp. Yamaguti (1936) and *D. mehrai* Pande (1937) from *D. amphichrus* Tubangui (1933). So these three species are considered to be synonym of *D. amphichrus*.



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FROM MUKHERJEE, 1966
INDIAN J. HELMINTHOL. 18(2): 94-103

Diplodiscus amphichrus Tubangui, 1933

SYNONYM: *Diplodiscus sinicus* Li, 1937.

HOST: *Rana limnocharis vittigera* (Günther) (syn. *R. vittigera* Wiegmann) (Ranidae).

HABITAT: Small intestine.

LOCALITY: Manila, Luzon Island, Philippines.

DATES: 11, 13 December 1961.

SPECIMENS: USNM Helm. Coll. No. 61700 (three slides with one adult specimen each).

MEASUREMENTS AND SOME PERTINENT DATA (based on eight adults and 40 immature worms from nine hosts; one mature and two young adults measured): Body 1,645 to 2,475 by 270 to 780; preoral body 0 to 16; pigment granules of disintegrated cercarial eyespots concentrated from just postbifurcal to posterior half of oral sucker but may extend beyond these levels; oral sucker 136 to 250 by 111 to 138; esophagus 189 to 295 long; acetabulum 370 to 642 by 410 to 575; testis 157 to 240 by 121 to 295; cirrus sac 60 to 110 by 48 to 110; ovary 77 to 194 by 61 to 194; vitellaria confluent anteriorly and usually posteriorly, interrupted at testis level, 21 to 25 follicles anterior to interruption and 16 to 19 posterior; cecal bifurcation to genital pore 205 to 420, to testis 370 to 420, to ovary 595 to 835; nine eggs 96 to 107 by 66 to 80.

DISCUSSION: This species was originally described by Tubangui (1933) from *Rana* spp from the same island as the present specimens; later, Tubangui (1947) specifically identified *Rana vittigera* as the only host. Li (1937a) described a new species, *D. sinicus*, from the same host species as our specimens from China and from *R. regulosa* Wiegmann from China and Amoy Island. Bravo (1941) declared Li's species a synonym of *D. amphichrus*. Our nine hosts harbored one (mature adult), two (two mature adults in one, two immature in another), three (one young adult and two immature in one, three immature in each of two others), seven (immature), nine (three young adults and six immature), and 18 (one mature adult and 17 immature) worms, respectively.

FROM FISCHTHAL AND KUNTZ, 1967

DIPLODISCUS AMPHICHRUS (TUBANGUI, 1933)
(Fig. 1)

Tubangui (1933) described *Diplodicus amphichrus* from Philippines. Srivastava (1934) described a new variety *Diplodiscus amphichrus magnus* from *Rana cyanophlyctis* from India. Pande (1937) described *D. mehrai* with only one testis while Kaw (1954) reported it from Kashmir with two testes. Singh (1954) redescribed *D. amphichrus* and considered that *D. amphichrus magnus* Srivastava, 1934 and *D. mehrai* Pande, 1937 are synonym to *D. amphichrus* Tubangui, 1933. The author collected ten specimens and from her collections observes variable position of genital pore and hence considers not of much value.

Body 1.01-3.29 mm. long and 0.49.1.44 mm. in maximum width in front of acetabulum. Oral sucker, 0.14-0.37 × 0.14-0.54 mm. in size. A pair of diverticula arising from its base, 0.08-0.23 × 0.14-0.47 mm. in size. Oesophagus long and tubular, 0.12-0.28 mm. in length. Oesophageal bulb 0.11-0.23 × 0.07-0.15 mm. in size. Intestinal caeca extend to anterior border of acetabulum. Acetabulum situated at posterior extremity, 0.37-0.90 × 0.51-1.37 mm. in size. Small central sucker present, 0.10-0.22 × 0.12-0.26 mm. in size. Excretory pore dorsal and preacetabular. Excretory bladder tubular. Genital pore either just behind oesophageal bulb or extracaecal, 0.33-1.15 mm. from anterior extremity. Single testis, entire, preovarian and postequatorial, 0.10-0.22 × 0.12-0.26 mm. in size. Cirrus pouch elongated to subglobular, 0.09-0.27 × 0.05-0.17 mm. in size. Ovary oval, on lateral side behind testis, 0.06-0.23 × 0.05-0.21 mm. in size. Receptaculum seminis absent. Vitellaria large, extending from oral diverticula upto anterior border of acetabulum, mainly lateral in position but meeting medially in the acetabular part forming a dorsally placed row. Eggs oval and non operculated, 0.091-0.132 × 0.032-0.075 mm. in size.

Host : *Bufo* sp.
Location : Rectum.
Locality : Lucknow.

DIPLODISCUS AMPHICHRUS (Tubangui, 1933)
Ventral view.

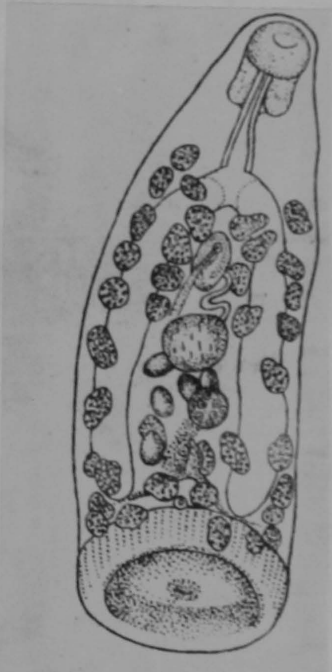
AGRAWAL, 1966
INDIAN J. HELMINTHOL. 18(2): 82-90

Diplodiscus amphichrus Tubangui, 1933.
Syn : *D. amphichrus magnus* Srivastava, 1934.
D. mehrai Pande, 1937.

Body conical, measures 1.6-3.3 x 0.6-0.86 mm. Oesophagus 0.27-0.44 mm. long with oesophageal bulb. Single testis, round to oval, median equatorial, measures 0.1[illegible]-0.46 x 0.12-0.46 mm. in size. Genital pore behind anterior third of body length, some distance behind oesophageal bifurcation. Vitellaria well developed, extending from level of oesophageal bulb, sometimes from behind oral diverticula to posterior sucker or in front of it. Vitelline follicles of two sides meet in median line both anteriorly and posteriorly. Eggs 104-112 x 62.4-70.7 microns in size.

Distribution : U.P.
Host : Frogs (*Rana* spp.).
Location : Usually rectum, rarely small intestine

FROM: MUKHERJEE & CHAUHAN, 1965



Text-fig. 7. *Diplodiscus amphichrus* Tubangui, 1933. (After Tubangui, 1933).

Diplodiscus amphichrus Tubangui, 1933

from Brasso-Hollis (1941)

-OVER-

Diplodiscus amphichrus Tubangui, 1933.

About two dozen specimens collected at Bombay in 1926 from the rectum of the frog, *Rana tigrina*, were given to me by Professor J. N. Karve for determination. These resemble in some respects *Diplodiscus amphichrus* Tubangui, 1933 and in others *D. amphichrus* var. *magnus* Srivastava, 1934. A few observations on the material at my disposal are recorded below.

Length 1·32–2·8 mm. Maximum breadth 0·54–0·98 mm. Œsophagus about 0·22 mm. long, œsophageal bulb 0·08 mm. dia. Oral diverticula 0·22–0·25 mm. long. Posterior sucker 0·55–0·9 mm. dia. Accessory sucker 0·135–0·28 mm. dia. Testis 0·65–0·92 × 0·25–0·4 mm. Cirrus sac about 0·13 × 0·10 mm. Genital pore post-bifurcal. Ovary 0·23–0·25 mm. dia. Vitellaria extending from intestinal fork to posterior sucker, not meeting anteriorly in the central line. Eggs 0·122–0·135 × 0·07–0·0715 mm.

FROM BHALERAO (1937)

Diplodiscus amphichrus Tubangui, 1933

SYNONYM: *Diplodiscus sinicus* Li, 1937.

HOST: *Rana cancrivora* (Ranidae).

HABITAT: Small intestine.

LOCALITY: Puerto Princesa, Palawan Island, Philippines.

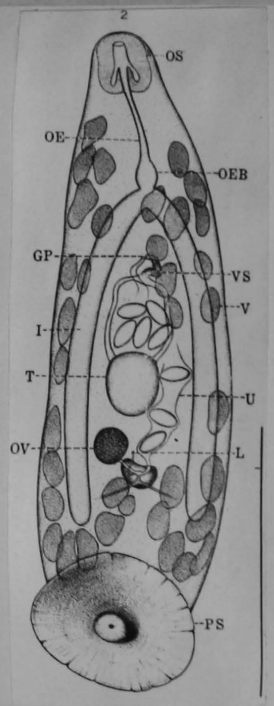
DATE: 24 May 1962.

SPECIMEN: USNM Helm. Coll. No. 60043.

MEASUREMENTS and some pertinent data (1 specimen): Body 3,781 by 951; preoral body 70 long; oral sucker 305 by 353; oral diverticula 206 by 162 to 166; esophagus 379 long, surrounded by sparsely distributed gland cells, with slight muscular bulb; acetabulum 760 by 913; testis 460 by 560, slightly constricted in middle of its width; cirrus sac 119 by 121; ovary 350 by 324, smooth; cecal bifurcation to genital pore 422, to testis 890, to ovary 1,242; vitellaria confluent anteriorly and posteriorly, commencing at cecal bifurcation and terminating short of cecal ends, follicles irregular to round in shape, somewhat interrupted at testis level with 25 follicles anterior to interruption and 19 posterior; 8 eggs measuring 103 to 121 by 63 to 77.

DISCUSSION: This parasite, first described by Tubangui (1933) from *Rana* spp. from Luzon Island, Philippines, has also been reported from the same host genus from India, Manchuria, and Korea. Our specimen readily keyed to *D. amphichrus* in the key given by Bravo (1941).

FROM FISCHTHAL AND KUNTZ (1964)



DIPLODISCUS AMPHICHRUS
TUBANGUI, 1933

HOST: RANA NIGROMACULATUS NIGROMACULATUS HALLOWELL

LOC.: LING-YUANG, JEHOL PROVINCE

GOOD DESCRIPTION AND DISCUSSION.

REF: FUKUI AND OGATA, 1938

Diplodiscus amphichrus Tubangui, 1933

SYNONYM: *Diplodiscus sinicus* Li, 1937.

HOST: *Rana limnocharis vittigera* (Gunther) (syn. *R. vittigera* Wiegmann).

HABITAT: Small intestine.

LOCALITY: Manila, Luzon Island, Philippines.

DATES: 11, 13 December 1961.

SPECIMENS: USNM Helm. Coll. No. 61700 (three slides with one adult specimen each).

MEASUREMENTS AND SOME PERTINENT DATA (based on eight adults and 40 immature worms from nine hosts; one mature and two young adults measured): Body 1,645 to 2,475 by 270 to 780; preoral body 0 to 16 pigment granules of disintegrated cercarial eyespots concentrated from just postbifurcal to posterior half of oral sucker but may extend beyond these levels; oral sucker 136 to 250 by 111 to 138; esophagus 189 to 295 long; acetabulum 370 to 642 by 410 to 575; testis 157 to 240 by 121 to 295; cirrus sac 60 to 110 by 48 to 110; ovary 77 to 194 by 61 to 194; vitellaria confluent anteriorly and usually posteriorly, interrupted at testis level, 21 to 25 follicles anterior to interruption and 16 to 19 posterior; cecal bifurcation to genital pore 205 to 420, to testis 370 to 420, to ovary 595 to 835; nine eggs 96 to 107 by 66 to 80.

DISCUSSION: This species was originally described by Tubangui (1933) from *Rana* spp. from the same island as the present specimens; later, Tubangui (1947) specifically identified *Rana vittigera* as the only host. Li (1937a) described a new species, *D. sinicus*, from the same host species as our specimens from China and from *R. regulosa* Wiegmann from China and Amoy Island. Bravo (1941) declared Li's species a synonym of *D. amphichrus*. Our nine hosts harbored one (mature adult), two (two mature adults in one, two immature in another), three (one young adult and two immature in one, three immature in each of two others), seven (immature), nine (three young adults and six immature), and 18 (one mature adult and 17 immature) worms, respectively.

FROM FISCHTHAL AND KUNTZ (1967)

Diplodiscus amphichrus Tubangui, 1933

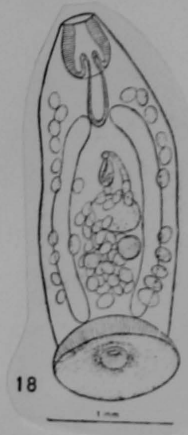
Syn. *D. sinicus* Li, 1937

D. mehrai Pande, 1937

(Fig. 18)

Ten specimens of the parasites were collected from the intestine of three specimens of *Rana tigrina* from Lahore.

The body of the worm is elongate and conical. The anterior end is comparatively narrow; while posterior end is broader. Maximum breadth of the worm is attained just in front of the acetabulum. The body shows a slight deflection along its ventral surface. The body in the living condition is transluscent. The tegument is thick and papillated but is without any spines. The oral sucker is terminal and bears two oral diverticula which arise from its base. The muscular oral sucker is longer than broad. The shallow acetabulum is situated at the posterior extremity of the worm. Its cavity is directed ventrally. In the centre of the acetabular cavity the acetabular wall is raised into an additional sucker like structure having a depression of its own. Pharynx is absent. The oesophagus is long and arises from the bottom of the oral sucker ventral to the oral diverticula. It bears a poorly developed bulb at its posterior extremity. The intestinal bifurcation lies at a distance of 0.757 mm from the anterior extremity. The caeca are long and wide, terminating at the anterior margin of the acetabulum.


18

The single testis lies near the middle of the worm, slightly to the left of the median line. It is rounded and oval in outline. Vesicula seminalis externa is present. The cirrus sac is slightly longer than broad and encloses vesicula seminalis and ductus ejaculatorius which is surrounded by unicellular prostatic glands. The ovary is spherical in shape and lies on the left side of the median line immediately behind the testis. The vitellaria are in the form of several rounded to oval large follicles, irregularly distributed between the posterior border of the oral diverticula and the anterior margin of the acetabulum. They are distributed in the intercaecal as well as extracaecal fields. The uterus has only a few coils. The metraterm is present. The genital opening is median and lies at a distance of 0.147 mm behind the intestinal fork. The eggs are a few, large, oval operculate and unembryonated. The excretory vesicle is tubular.

MEASUREMENTS

(All measurements in millimetres)

Body length	2.032 – 4.065
Body breadth	0.665 – 1.124
Oral sucker	0.335 – 0.685 × 0.302 – 0.445
Ventral sucker	0.581 – 0.845 × 0.723 – 1.122
Oesophagus	0.196 – 0.575
Ovary	0.117 – 0.245 × 0.107 – 0.215
Testis	0.205 – 0.392 × 0.205 – 0.490
Eggs	0.078 – 0.127 × 0.066 – 0.076

Host: *Rana tigrina*
Location: Intestine
Locality: Lahore

DISCUSSION

The worms under study resembles *Diplodiscus amphichrus* Tubangui, 1933 in all essential features and has been identified as such. However, this species is being reported for the first time from Pakistan.

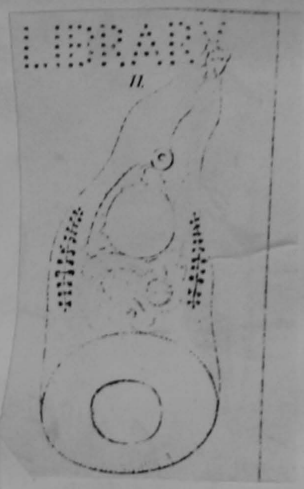
From BHOTTA and KHAN, 1975

Diplodiscus cornu (Dies.).

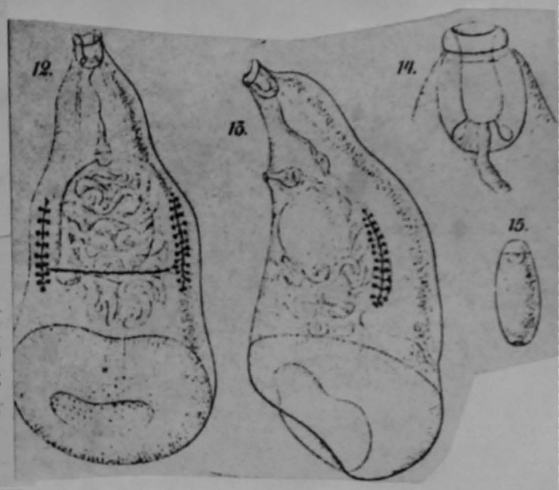
(Taf. 24, Fig. 11—15.)

Amphistoma cornu C. M. Diesing (5), p. 235, tab. 20, fig. 12—13.

Von dieser Art lagen mir 6 Exemplare vor, welche ich im Glas No. 944 der Zoologischen Abteilung des Wiener Hofmuseums unter dem Namen *Amphistoma cornu* Dies. vorfand und welche nach der Anmerkung Diesing's von J. Natterer 1832 am Fort des Rio branco aus *Cataphractus vaca* = *Doras vaca* gesammelt worden sind. Dieselbe Fischgattung ist auch auf der Etikette des Glases als Wirt angesehen. Alle 6 Exemplare sind vollständig entwickelt und mit Eiern gefüllt, 3 derselben sind aber etwas defekt und bloß 3 ganz intakt.



Die Körperform gleicht annähernd einem Kegel und noch mehr einem kurzen Horn (Taf. 24, Fig. 11—13); das hintere Ende ist auffällig breiter als das vordere, die rechte und linke Seite stumpf gerundet, abschüssig nach vorn laufend, an beiden Seiten des Hodens bogig, davor und dahinter etwas vertieft; der Bauch ist fast gerade, kaum merklich gekrümmt, der Rücken dagegen ziemlich stark bogig. An dem vordern Körperende zeigt sich um die Mundöffnung eine ringförmige Absonderung, welche die zwischen der Mundöffnung und dem Vorderende des Schlunds befindlichen Muskelkegel enthält. Die Körperlänge beträgt 4 - 4,3 mm, der größte transversale Durchmesser 2—2,2 mm, der kleinste transversale Durchmesser um die Mundöffnung 0,25 mm, der größte dorsoventrale Durchmesser 2—2,2 mm.



Der Saugnapf liegt am hintern Körperende und ist vom Bauch oder Rücken gesehen ganz kreisförmig (Taf. 24, Fig. 11. 12). Von der Seite gesehen ist die Wandung am Bauch schmäler als am Rücken, woher das distale Ende gegen den Bauch etwas schief abgeschnitten erscheint, demungeachtet blickt ihre Öffnung dennoch gerade nach hinten (Taf. 24, Fig. 10); ihr Durchmesser beträgt 2—2,2 mm, die Dicke der Wandung 0,7—1,2 mm, der Durchmesser der Öffnung 1—1,2 mm; der Grund der innern Höhlung ist glatt.

Die Körpercuticula ist durchaus glatt, gleich dick, ihr Durchmesser beträgt 0,002—0,004 mm. Die Querfasern des Hautmuskelschlauchs sind fein, sie stehen gedrängt, die Längsmuskelfasern sind weit dicker und bilden nahezu Bündel; die diagonalen Fasern sind gleichfalls gut entwickelt, aber dünner als die Längsfasern.

Die Mundöffnung liegt gerade an dem vordern, spitzesten Teil des Körpers; sie ist kreisförmig, ganzrandig, am Rande stehen keine Papillen, ihr Durchmesser beträgt 0,15 mm, zwischen sie und den Schlund ist ein Muskelkegel eingekeilt, welcher schon äußerlich wahrzunehmen ist. Die Muskulatur des Muskelkegels ist relativ schwach entwickelt, seine Dicke beträgt 0,08 mm (Taf. 24, Fig. 14).

Der Pharynx ist breit ellipsenförmig (Taf. 24, Fig. 14), das hintere Ende gerundet, die Seiten gleichförmig stumpfbogig, ihre Länge beträgt 0.25—0,4 mm, die Öffnung gegen den Mund 0,1 mm. Die innere Höhlung ist schlauchförmig, in der Mitte am breitesten; die Länge beträgt 0,25 mm, die Dicke der Wandung 0.1 mm. Die Pharyngealtaschen sitzen in der Muskelwandung und daher äußerlich nicht bemerkbar, sie sind relativ sehr klein, schmal schlauchförmig, ihre Länge beträgt 0,08 mm. In der Muskelwandung befindet sich vorn ein Sphincter.

Der Osophagus entspringt in der Mittellinie des hintern Pharyngealendes und zieht dann, die Muskelwand derselben durchbrechend, anfänglich etwas gegen den Bauch und nach hinten, nähert sich aber bald danach dem Rücken, dann aber in fast gerader Linie den Darmschenkeln, an deren Grenze er einen schmalen Bulbus bildet. Seine Länge, in gerader Linie gemessen, beträgt 0,7—0,8 mm.

Die Darmschenkel verlaufen anfänglich etwas seitlich nach außen, dann aber schief nach hinten und zwar nahe den beiden Körperseiten, in geringem Maße dem Rücken genähert; ihr Verlauf ist fast gerade, nach hinten verbreitern sie sich allmählich, sind relativ sehr kurz und reichen bald bis zu dem Keimstock herab, von dem Saugnapf sind sie 0,7—0,8 mm entfernt, ihre Länge beträgt 1,3 mm.

Die Excretionsgefäßstämme ziehen unter und neben den Darmschenkeln und endigen nahe dem Saugnapf in der Excretionsblase, die in der Mittellinie des Körpers entspringt. Der Porus excretorius öffnet sich am Rücken, gerade an der Grenze des Saugnapfs, bzw. bei dem auf dem Rücken liegenden Tiere in der Mitte des Saugnapfs, nach außen.

Die Genitalöffnung liegt im vordern Körperdrittel, ca. 1,2—1,35 mm von der Mundöffnung entfernt, in der Richtung des Ösophagealbulbus, ihr Umkreis ist schwach erhaben, trichterförmig, ihre Muskulatur ist aber nicht kräftiger entwickelt und bildet somit keine Genitalscheibe (Taf. 24, Fig. 11, 13).

Das männliche Geschlechtsorgan ist durch einen einzigen Hoden repräsentiert, welcher ganz kugelrund mit glatter Oberfläche und auffällig groß ist, sein Durchmesser beträgt 1 mm; er liegt etwas auf dem Raum zwischen den Darmschenkeln, erhebt sich aber gegen den Rücken nicht über die Mittellinie des Körpers, am Bauch hingegen ist er der Körperwandung genähert. Das Vas deferens ist zu einer Vesicula seminalis externa ausgedehnt und geht dann in die im Innern des Cirrusbeutels verschlungene Vesicula seminalis interna über. Der Cirrusbeutel ist rund. Der Ductus ejaculatorius öffnet sich gemeinsam mit dem Metaterm in den Ductus hermaphroditicus.

Der Keimstock ist kugelrund, von 0,3—0,45 mm Durchmesser und liegt auf dem von den Darmschenkeln umschlossenen Raum, teils außerhalb desselben, nahe dem hintern Ende des linken Darmschenkels (Taf. 24, Fig. 12). Der Keimgang ist ziemlich lang, zieht in der Mittellinie des Körpers etwas schief nach hinten und nimmt in seinem Verlauf den Laurer'schen Kanal, das Receptaculum seminis und das Dotterreservoir in sich auf, worauf er sich in der Schalendrüse öffnet. Die Öffnung des Laurer'schen Kanals befindet sich nicht über dem Keimstock, sondern in der Mittellinie des Körpers, ungefähr 0,7—0,9 mm von dem Porus excretorius entfernt. Das Ootyp ist gestreckt schlauchförmig und liegt unter dem Keimstock, von diesem und dem Saugnapf gleich entfernt. Der Uterus zieht anfänglich nach hinten, dem Rücken zu, tritt dann an der Grenze des Saugnapfs zum Bauch und füllt den ganzen Raum zwischen den Darmschenkeln aus und gelangt schließlich über dem Hoden bis zum Cirrusbeutel, hinter welchem er in dem Ductus hermaphroditicus endigt.

Die Dotterstöcke laufen zwischen dem Außenrand der Darmschenkel und der Körperwandung, der letztern genähert, nach oben, fast bis zu dem obern Rand des Hodens; ihr hinteres Ende überragt die Darmschenkel, sie sind ca. 1 mm lang. Jeder Dotterstock besteht aus 12—18 kapselförmigen Follikeln, deren Gang in je eine größere Leitung mündet; die Querleitung entspringt über dem hintern Drittel des Dotterstocks und bildet über dem Keimstock ein Reservoir (Taf. 24, Fig. 12).

Die Eier sind gestreckt elliptisch, 0,13—0,14 mm lang, mit einem größten Durchmesser von 0,06—0,07 mm; ihr Cocon ist gekappt, am hintern Ende mit einer eigentümlichen Haftscheibe, in deren Mitte sich eine kurze stielartige Erhebung befindet (Taf. 24, Fig. 15).

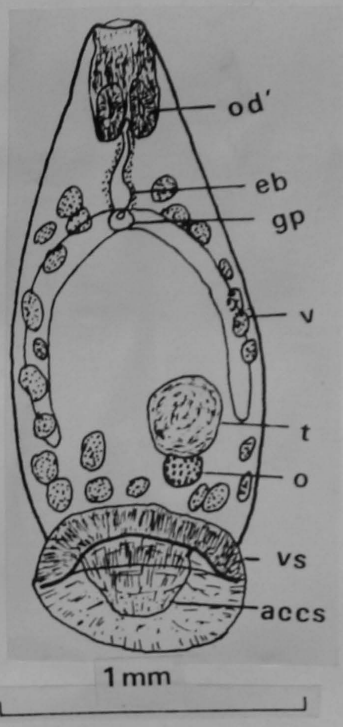
Diese Art ist von *Diplodiscus marenzelleri* durch die Struktur des Pharynx, den unpaaren Hoden, die kürzern Darmschenkel und die Anwesenheit des Cirrusbeutels leicht zu unterscheiden. Trennende Merkmale bilden aber auch die Struktur des Saugnapfs, die Lage der Dotterstöcke und der Muskelkegel der Mundöffnung. All diese Verschiedenheiten schließen die Möglichkeit gänzlich aus, daß *Diplodiscus marenzelleri* und *Diplodiscus cornu* bloß 1- und 2hodige Varietäten ein und derselben Art seien, wie dies von *Diplodiscus subclavatus* bekannt ist.

Genus: *Diplodiscus* DIESING, 1836.

Diplodiscus fischthalicus n. sp. MESKAL, 1970
(Text figs. 18—20; Pl. II figs. 4, 6, 7; Pl. III figs. 3—5.)

Host: *Rana angolensis* (BOCAGE, 1866)
Habitat: Rectum
Localities: R. Dima, Fanta Stream, Sebeta Stream and Tafo Stream.

Number of Hosts		Intensity of Infection				Locality	Date of collection
Inspected	Infected	Total number of worms	Load per host				
			Min.	Max.	Mean		
13	4	7	1	3	1.8	R. Dima	7.8.67
9	2	11	4	7	5.5	R. Dima	28.8.67
4	1	4	4	4	4	R. Dima	20.8.67
15	1	1	1	1	1	Fanta Stream	24.8.68
14	2	8	4	4	4	Sebeta Stream	24.8.68
7	1	2	2	2	2	Sebeta Stream	1.12.67
14	1	1	1	1	1	Sebeta Stream	26.11.68
8	4	16	1	8	4	Tafo Stream	8.7.66
52	9	26	1	6	2.8	Tafo Stream	31.8.66
15	11	68	1	17	6.2	Tafo Stream	6.5.67
9	5	10	1	3	2	Tafo Stream	22.11.68



Description

General Morphology: Unlike all other trematodes in the present paper *Diplodiscus* is thick, conical and circular in cross-section. It consists of a more or less pyramidal anterior region tapering towards the mouth, an oval post-esophageal body and a hemispherical posterior sucker. The body measures 1830—2760 (2230) long by 810—900 (858) wide. The integument is made of a well marked 2—10 microns thick and smooth cuticle. The anterior third of the body is profusely supplied with cells that are associated with the genital atrium, esophagus, oral sucker and oral diverticula. Such cells are found along the margins of the acetabulum as well, while they are sparser in the rest of the body (Pl. III, figs 3—5).

The oral sucker is thick and muscular measuring 148—237 (179) by 163—259 (193), terminally situated with its opening slightly ventral. Dorso-posteriorly the oral sucker extends into two oral diverticula, each of which measures 89—170 (129) long and 74—111 (98) wide. The well developed, large hemispherical acetabulum, situated at the posterior end of the body, measures 481—990 (677) in diameter at its widest opening. At the center of this hemisphere is a prominent accessary sucker with a diameter of 155—300 (208) across its terminal end (Pl. III, fig. 3).

Digestive Organs: The oral sucker opens slightly ventral at the anterior end of the body. The mouth at the bottom of this leads to an opening that branches into three channels which are well guarded with strongly muscular sphincters. Two of the channels branch off on either side of the median line to lead into the orifices of the laterally placed oral diverticula (Pl. III fig. 3). The other opening leads into a more ventrally situated esophagus densely surrounded with glandular secretions (Pl. III fig. 4). As in other species of *Diplodiscus* no pharynx has been observed. The esophagus 185—296 (255) by about 74, slightly curves dorsally and enlarges into a muscular esophageal bulb 148—200 (170) long by 74—104 (89) wide. At the posterior end the bulb bends dorsally sharply to join the intestinal bifurcation. Ceca are simple and extend posteriorly up to the hind end of the testis. They measure 750—1140 (908) in length and up to 80 in width. The inner surface of

-OVER-

the intestinal wall is lined with elongate epithelial cells, about 10 by 5, and closely packed in a single layer. In all sectioned specimens the intestinal lumen was almost filled with an eosinophilic substance. The excretory system is exactly the same as in *D. japonicus* (YAMAGUTI, 1936) and is accordingly not described here.

Reproductive System: The reproductive organs are arranged mainly dorsoventrally; when viewed from the ventral surface the dorsal structures thus become obscured by the ventrally superimposed structures. In the female system (text fig. 20) a long narrow Laurer's canal, about 12 in diameter, opens into the right side of the ootype. The latter receives a short narrow oviduct antero-ventrally while dorso-posteriorly it opens through a short narrow tube to a deep chamber thickly surrounded by Mehlis' gland. This chamber in turn opens postero-ventrally into a vitelline reservoir. The uterus arises from the left side of the Mehlis' gland and immediately takes an anterior course without any descending limb and turns ventro-dextrally on the dorsal side of the ovary. It then proceeds in a few loops on the ventral side of the testis, and at the anterior edge of this gonad it invariably takes a course towards the dorsal side, only to turn upon itself up to the median line from where it ascends close to the hind border of the intestinal bifurcation. Then it enters a narrow muscular metraterm. The latter is richly surrounded with secretory cells which extend 30—70 microns on either side of the genital pore and about 15 microns dorsally (Pl. III fig. 5).

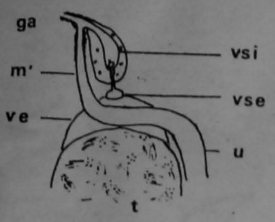


Fig. 19. Male genitalia of *D. fischthalicus*

The ovary is almost globular with smooth surface and measures 120—185 (155). It is situated postero-dorsal to the testis and slightly sinistral to the median line. The ova are markedly at distinct stages of development. Thus the mature ova are found towards the center of the ovary, while at the ovarian periphery relatively smaller oocytes are found. Two mature strongly stained ova measuring about 17 by 15 were observed in the oviduct of a sectioned specimen. The gravid uterus is filled with eggs which are non operculate and relatively large, 108—124 (115) by 52—80 (63), but are always relatively few in number.

The vitellaria consist of well developed more or less elongate and sometimes ovoid to almost globular follicles arranged laterally from the level of esophageal bulb (or slightly anterior to it) almost to the acetabulum. Individual follicles measure 126—171 (148) by 81—148 (101). 11—19 follicles on the right side 13—16 on the left and 2—4 transversely at the posterior end of the main body have been counted in whole mount preparations. However, larger number of follicles could be present as these structures are superimposed on each other ventro-dorsally. Vitelline cells are conducted by transverse vitelline ducts to a deep vitelline reservoir extending ventrally from a dorso-posterior region of the ovary. The reservoir opens at the posterior end of the chamber surrounded by Mehlis' gland.

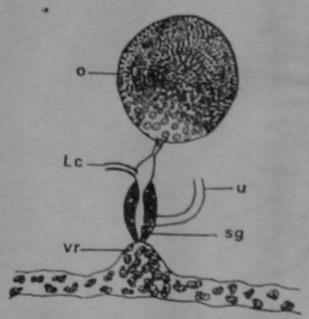


Fig. 20. Female genitalia of *D. fischthalicus*

The male genital system consists of a large almost globular comparatively smooth surfaced testis about 296—520 (365) by 296—400 (340) situated in the posterior half of the main body, sometimes almost filling the intercecal space and extending from just beneath the ventral surface of the body to the ventral surface of the ovary dorsally. Two short *vasa efferentia* arise from the latero-anterior border of the testis and unite a short distance in front of it to form small bulbous *vesicula seminalis externa* (text fig. 19). A short rather thick tube arises anteriorly from the latter and enters the cirrus pouch postero-dorsally some 25 microns behind the esophageal bifurcation. The cirrus pouch is a thin walled sac slightly longer than wide and extending dorso-posteriorly from just behind the genital atrium. When viewed from the ventral surface of a total mount preparation it measures up to 105 microns in diameter. In horizontal sections it measures up to

— CONTINUED —

67 antero-posteriorly and 44 transversely. In transverse sections the dimension is up to 74 ventro-dorsally and 37 transversely. It contains a thick walled convoluted *vesicula seminalis interna* in its posterior half and an ejaculatory duct in the anterior half (Pl. II fig. 6; Pl. III fig. 5). No cirrus has been observed in sectioned specimens. However, a short, narrow spinous structure, presumably the cirrus, was observed projecting antero-dextrally out of the genital atrium in a whole mount preparation (Pl. II fig. 7). It measured 32.5 in length and 5 in width. The common genital atrium is only a narrow highly muscular tube which opens to the ventral surface at the level of esophageal bifurcation. In a corss-sectioned preparation it measured 10 wide and 17 deep (ventro-dorsally). At its dorsal end it bifurcates into two narrow tubes leading to the male and female ducts (Pl. III fig. 5 and text fig. 19).

Discussion

TUBANGUI (1933) distinguished his Philippine *Diplodiscus amphichrus* from *D. subclavatus* by the fact that vitellaria in the former species and not in the latter meet anteriorly in the median line. YAMAGUTI (1936) differentiated *D. japonicus* (YAMAGUTI, 1936) from *D. amphichrus* by the disposition of vitellaria which do not meet anteriorly. After raising the Indian *D. amphichrus magnus* SRIVASTAVA, 1933 to the species level *D. magnus*, FISCHTHAL and THOMAS (1968) reduced *D. japonicus* to synonymy with the species. They also described their Ghanaian material under this new species.

From the evidence in the illustration, *D. amphichrus* var. *magnus* from India definitely belongs to a new species. It has relatively short esophagus, the intestinal bifurcation is situated far anteriorly, pharyngeal pouches are conspicuously small and appendicular, and the cirrus sac is situated distinctly far behind the intestinal bifurcation. These features distinguish the Indian *Diplodiscus* from *D. subclavatus*, *D. amphichrus* and *D. japonicus*.

If the above criteria of speciation are acceptable, then *D. japonicus* cannot be accommodated in *D. magnus* as declared by FISCHTHAL and THOMAS since, except for the weak criterion of absence of anterior vitelline confluence, these animals have very little in common. As a matter of fact, the Japanese *Diplodiscus* shares more features with *D. subclavatus* than with *D. amphichrus* or *D. magnus*. The only difference between the European and Japanese forms is, as pointed out by YAMAGUTI, "size of the body and eggs". Egg size in *D. subclavatus* as measured by LOOSS (in DAWES, 1956) is 128—137 by 82—90. The size as given by ODENING (1959) is 57—70 by 86—95. The variation between these two measurements for eggs of the same species makes one suspicious about the reliability of egg size for speciation in the genus *Diplodiscus*. Relative size of esophagus, disposition of intestinal bifurcation and genitalia and morphology of pharyngeal pouch in *D. japonicus* are much the same as in *D. sublcavatus*.

Such features as the relative size of esophagus, proportion of pharyngeal pouches to oral susker, and position of cirrus sac in relation to intestinal bifurcation bring the Ghanaian for ı closer to the present species than to *D. magnus* from India.

Lack of vitelline confluence in the anterior median line, disposition of genital pore, relative length of esophagus and morphology of the pharyngeal pouch place the present species closer to *D. subclavatus* than to *D. magnus* or *D. amphichrus*. However, the conspicuous cirrus pouch distinguishes the present form from *D. subclavatus* in which no cirrus sac has been observed. The two further differ in body size, the European form being at least twice as large as the present species. *D. fischthalicus* n. sp. differs from *D. pallascatus* MANTER and PRITCHARD, 1964 by the extra large spherical cirrus sac which is about equal in size to the oral sucker in the latter species.

Specific Diagnosis: With the features of the genus *Diplodiscus* DIESING, 1836; cirrus sac moderately large; no vitelline confluence anteriorly in the median line; body length up to 2760; egg size 108—124 by 52—80; genital pore at level of intestinal bifurcation; cirrus proper and esophageal glands present.

Diplodiscus japonicus (Yamaguti, 1936) Li, 1937

L. Y. Li (= Li, Lai Yung), 1937

Diplodiscus japonicus (Yamaguti, 1936) (fig. 4 & 5)

Syn. *D. amphichrus japonicus* Yamaguti, 1936

The following description is based on material collected from Canton. Measurements represent the average of ten specimens. Body conical, 0.739 by 1.8 mm. in size; cuticle smooth with the exception of the margins of the suckers which are provided with tiny papillae, the latter generally not uniform in size. Eye-spots of larval stage persistent on dorsal surface of adult. Oral sucker terminal, 0.242 mm. long by 0.195 mm. wide including well developed pharyngeal pockets. Esophagus, 0.273 mm. long, passes out ventrally from oral sucker, double walled. Masses of Begleitzellen found on greater portion of esophagus. Esophageal bulb fairly conspicuous, 0.117 by 0.085 mm. in size. Intestinal branches reach near margin of posterior sucker which measures 0.616 mm. across. Central conical papilla of this powerful sucker measures 0.136 mm. across.

Testis one, somewhat oval to round, median to very slightly out of median line, 0.108 mm. long by 0.312 mm. wide. Cirrus sac oval to elongated, 0.109 by 0.062 mm. in size. Genital pore slightly out of median line, immediately behind intestinal bifurcation.

Ovary small, sub-globular, 0.102 by 0.128 mm., to one side of median line, and some distance behind testis. Mehlis' gland and ootype median and behind ovary. Laurer's canal opens dorsally opposite ovary. Uterus short, coiled, intercecal. Vitellaria follicular, extending from region behind eye-spots to posterior sucker, 34-42 in all. These vitelline follicles are of two groups, one in front of testis and the other behind it. Those of posterior group meet medially behind ovary, while those of anterior group do not show any tendency to come together in anterior median position.

Eggs, 0.105-0.120 by 0.053-0.067 mm. oval, generally few in number.

Excretory system takes its origin at posterior sucker. Radiating to margin from center of sucker, there are six collecting tubules which merge into a main excretory tubule on each side of conical papilla. Each of these two main tubules passes forward into body proper turning back on itself on ventro-lateral surface of excretory bladder, then taking a transverse course toward side of body. Each then curves forward at right angles reaching near pharyngeal pockets to continue as a wider descending collecting tube which crosses caecum of its own side and continues between caecum and vitelline bodies. This tube then turns dorsad in front of testis along medial wall of caecum to continue to excretory arm, which, after looping over itself unites with its fellow of the other side to open into excretory bladder at its anterior end. The latter is an active contractile organ opening out through a dorsal medial pore in front of posterior sucker.

Diplodiscus japonicus (Yamaguti, 1936) is closely related to *D. sinicus* differing from it in the position of the cirrus sac and the genital pore which are located just behind the intestinal bifurcation, in the position of the ovary which is not immediately post-testicular, and lastly in the smaller (six on each side) radiating excretory tubules in the posterior sucker. This worm was described by Yamaguti as a sub-species of *D. amphichrus* on account of the arrangement of its vitelline bodies which do not meet in the median line in front of the testis. Specimens collected from the large intestine of *Rana limnocharis*, *R. rugulosa* and *Ooeidozyga lima* from Canton agree very well in all important morphological characters with the Japanese form which Yamaguti described. Careful comparative studies, however, show that both the present and the Japanese form differ from the Philippine species, *D. amphichrus*, first, in the position of the cirrus sac and genital pore which are located just behind the intestinal bifurcation; second, in the position of the ovary which is generally some distance away from the testis; third, in the position of the testis which is slightly to the side of the median line (this character is not constant in the Chinese form); and finally, in the arrangement of the vitelline follicles which do not meet in the anterior median line. All these differences with the exception of the position of the testis are found to be constant enough to make necessary a specific separation of it from the Philippine species.

from Bravo-Hollis (1941)

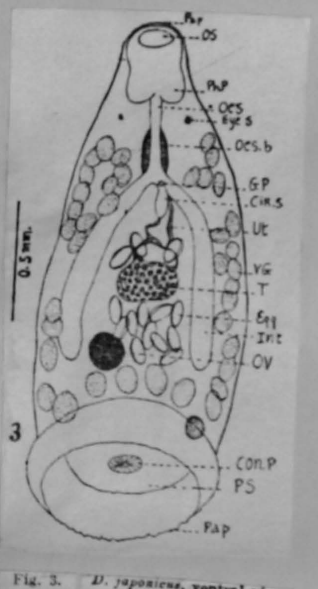


Fig. 3. *D. japonicus*, ventral view.

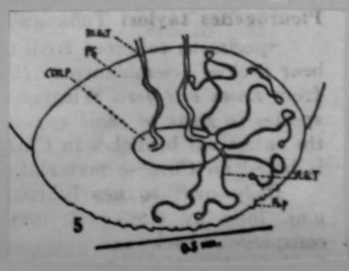


Fig. 5. *D. japonicus* showing arrangement of excretory tubules at the posterior sucker.

Mukherjee (1965) believes this is a syn of D amphichrus.

Diplodiscus khyberensis ~~n. sp.~~ BHUTTA AND KHAN, 1975

(Fig. 19)

The following account is based upon 8 flukes recovered from the rectum of 2 specimens of *Rana cyanophylictis* in Peshawar.

The body of the fluke is conical. The maximum breadth of the fluke obtains in front of the acetabulum which lies at the posterior extremity. The tegument is thick and papillated and unarmed and in the live specimens it is transluscent. The terminal oral sucker is well-developed, longer than broad and is provided with a pair of oral diverticula at its base. The large ventral sucker faces posteroventrally and its wall in the centre is thickened to form an additional sucker having its own depression. The oesophagus is long and bears a distinct oesophageal bulb at its posterior extremity. The pharynx is absent. The intestinal bifurcation is at the anterior one-third of the body. The caeca are much broader than the oesophagus and reach the anterior margin of the ventral sucker.

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There is a single large testis situated just behind the equator of the worm. It is rounded to slightly oval. Vesicula seminalis externa is present. The cirrus sac is a small oval structure, enclosing the vesicula seminalis interna, the ductus ejaculatorius and pars prostatica. The common genital opening is just postbifurcal and median. The ovary lies close behind the testis. In some specimens the anterior margin of the ovary overlaps the posterior margin of the testis. It is almost spherical in outline and submedian, situated towards the left side of the median line. The vitellaria are in the form of a variable number of rounded to oval follicles of large size, extending from the level of the oesophagus to the middle of the ventral sucker. Mainly the follicles are distributed along the lateral fields but behind the caeca the follicles of the two sides become confluent in the middle. The uterus is short with a few to several eggs. It is intercaecal but in one specimen it extends into the extraceacal field at one point. The eggs are large, oval, light, yellow, operculate and unembryonated. The excretory vesicle is tubular.

Host: *Rana cyanophylictis*
Location: Rectum
Locality: Peshawar

DISCUSSION

The present species differs from *Diplodiscus doyeri* Ortlepp, 1926; *D. amphichrus* Tubangui, 1933 and *D. saccolosus* Yuen, 1922 in the position of the genital pore. It also differs from *D. doyeri* in the size of the body and principal organs, from *D. amphichrus* in the comparative size of the oesophageal bulb and the oral diverticula and from *D. saccolosus* in the nature of the intestinal caeca and size of the body. *D. megalochrus* Johnston, 1912 has similar position of the genital pore but differs from the present species in principal measurements, in the ratio between the suckers, extent of caeca, position of testes, position of ovary in relation to testes and extent of uterus. *D. subclavatus* Diesing, 1836 can be differentiated from the present species in size of the body, in having larger eggs and in that its vitellaria are restricted to the lateral sides. In view of these differences it is concluded that a new species is being dealt with for which the name *Diplodiscus khyberensis* is proposed.

Measurements (All measurements in millimetres)	
Body length	0.787 – 1.121
Body breadth	0.333 – 0.545
Oral sucker	0.176 – 0.333 × 0.127 – 0.245
Oral diverticula	0.109
Ventral sucker	0.225 – 0.545 × 0.313 – 0.787
Oesophagus	0.147 – 0.245
Oesopaageal bulb	0.068
Ovary	0.098 – 0.196 × 0.061 – 0.156
Testis	0.137 – 0.196 × 0.137 – 0.215
Eggs	0.096 – 0.127 × 0.066 – 0.079

Paramphistomidae

Diplodiscus megalochrus Johnston, 1912

Subclavate worms, 3- 4 by 1.25 to 1.5. Integument smooth. Suckers comparatively large; ratio of anterior to posterior: 3: 10. Diverticula of the oral sucker well developed, at the pester esophagus long, pharynx well-developed, at posterior end of esophagus. Intestinal limbs moderately wide and short. Excretory pore at the extreme posterior end of the body. Genital opening behind the intestinal fork. The single testis large and generally somewhat cubical; a large seminal vesicle arranged in a number of coils. Copulatory organs present. Ovary oval, behind the testes; shell gland about as large as ovary. Vitelline glands of large follicles, partly in a single, and partly in a double row along the sides of the body, outside the intestinal limbs. Coils of the uterus occupying a great part of the body-space, from the posterior end to the genital opening. Eggs with thin, hyaline shell, 132 by 66 µ/
In the rectum of Hyla aurea and Limnodynastes peronii
Locality: Australia

According to Fukui (1929) + Krull + Price (1932) this species is a synonym of D. subclavatus (Goeze)

Pande, 1937

Diplodiscus mehrai, n. sp.

The worms, measuring 2·1–3·2 in length and 1–1·3 in maximum breadth which lie in front of the acetabulum, are conical in shape with a slight deflection on their ventral surface and are covered with thick, smooth, cuticle. The body in the living condition is translucent with the excretory vessels visible as black wavy tubes. The terminal oral sucker with a dorsal lip and provided laterally with a pair of diverticula—the oral evaginations, arising from its base, measures 0·36 in length (median line) and 0·2–0·32 in breadth. It is 0·32–0·36 broad in the region of the diverticula, which are 0·2 × 0·18 in size. The œsophagus, 0·38–0·5 in length, arises from the bottom of the oral sucker ventrally to the oral evaginations and has an œsophageal bulb of 0·11–0·14 × 0·07–0·1 size at its end. It bifurcates into wide cæca just in front of the anterior third of body length. The cæca terminate a little in front of the acetabulum. The latter is shallow and situated at the posterior end of body with its opening directed ventrally, measuring 0·56–0·74 × 0·9–1·1 in dimensions. In the centre of the acetabular cavity the wall is raised internally into an additional sucker, with a depression in it, which divides the entire acetabulum into two halves. A few branches of the lymph system project dorsally into this additional sucker. The median genital pore is situated on the ventral surface just behind the œsophageal bulb and leads into a narrow and small genital

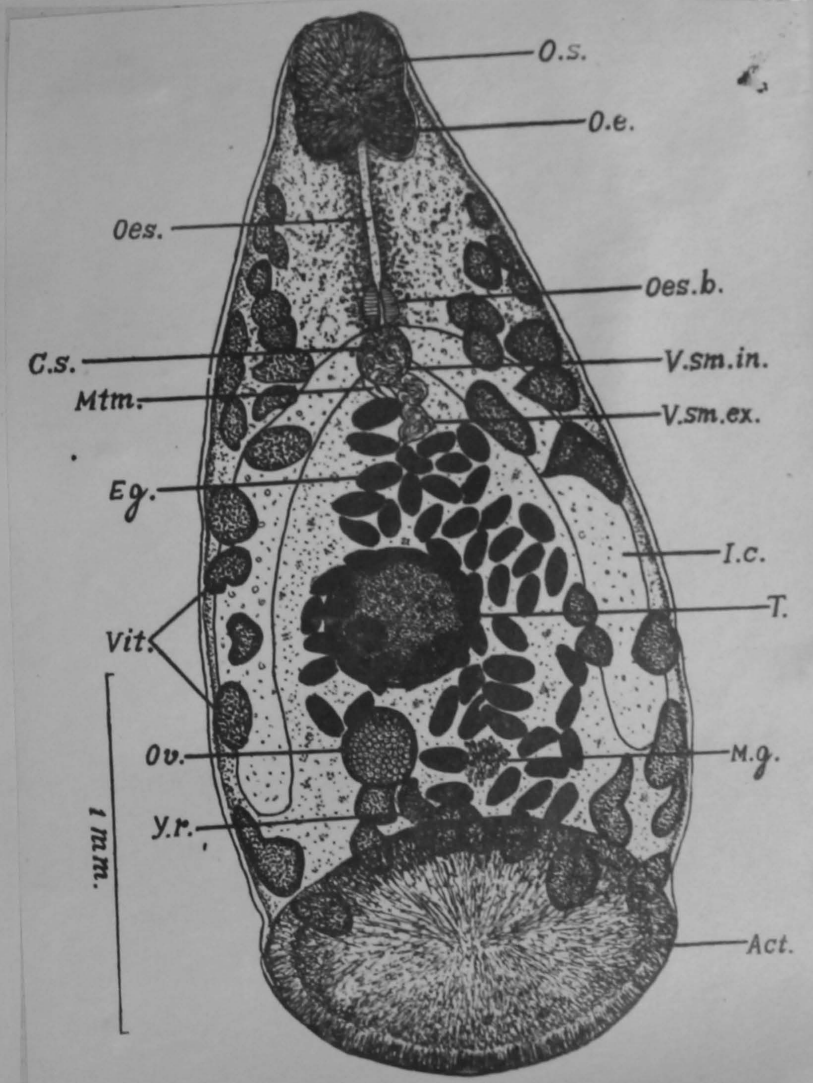


Fig. 1.

atrium. The excretory pore lies dorsally midway between the e posterior end of the body and the central sucker inside the acetal It leads into a tubular excretory vesicle, which is obliquely situated the acetabulum between it and the Mehli's gland. Posteriorly the narrows just behind the centre of the acetabulum into the thick-

excretory canal, which is lined with cuticle continuous with that of the body wall. At this point the bladder receives ventrally a duct from the dorsal side of the additional sucker-like structure. The excretory vesicle, just behind its anterior end, receives a pair of large vessels which extend straight outwards to the sides and then backwards immediately behind the hind ends of the cæca and then forwards, describing a loop between the acetabulum and the ends of the cæca. Then they run forwards in a wavy course, dorsally to the cæca, in front of the testis as far as the level of the oral diverticula. Posteriorly the vessels lie internally and ventrally to the cæca. A large number of well-developed, elongated, subcuticular gland cells are present below the musculature both on the dorsal and ventral surfaces. They also surround the œsophagus and the genital pore and have also been observed in the substance of the suckers. The lymph system, as studied from sections, consists of two large vessels with membranous walls lying outside and dorsally to the cæca. These vessels give off branches to all parts of the body between the different organs. A number of these branches also surround closely the suckers.

The single testis, nearly globular, is situated ventrally near the middle of the body, measuring 0·23–0·4 × 0·34–0·45 in size. From its antero-lateral border the two vasa efferentia arise, which unite about midway between the anterior margin of the testis and the genital pore to form the sinuous vesicula seminalis externa. The cirrus-sac, 0·18 × 0·16 in size, has membranous walls and contains in greater part of its cavity the coiled vesicula seminalis interna. The latter passes into the thick-walled and nearly straight ejaculatory duct which is surrounded by the unicellular prostatic glands.

The ovary, 0·16–0·18 in diameter, is spherical in shape. It is laterally situated to the left side just behind the testis. The oviduct arises from the middle of its dorsal side and runs caudad to enter the Mehli's gland which lies dorsally to the right side of the ovary with the well-developed yolk-reservoir just behind it and immediately in front of the acetabulum. The Laurer's canal opens dorsally immediately in front of the Mehli's gland. The receptaculum seminis is absent. The uterus, after its origin from the Mehli's gland, travels posteriorly on the right side of the ovary and on reaching near the anterior border of the acetabulum turns forward, lying dorsal to the testis and occupying the entire inter-cæcal space. Ventrally to the vesicula seminalis externa, the uterus passes into the thick-walled and convoluted metraterm. The metraterm is provided with gland cells opening into its ventral wall. The ripe eggs measure 0·14 × 0·09 in size. The follicular vitellaria extend from a little distance behind the oral evaginations to the

nterior border of the acetabulum, meeting mesially in the acetabular part of the body. The large follicles 35–40 in all, lie laterally and ventrally to he cæca except in the hinder region where they pass mesially forming a dorsally placed row.

Habitat—Rectum.

Locality—Almora.

D. mehrai

p. 2

Remarks.—The only *Diplodiscus* species from frog known hitherto from India is *Diplodiscus amphichrus* Tubangui, 1933—variety *magnum* Srivastava, 1934, reported from *Rana cyanophlyctis* of Sitapur (Oudh). The seven species listed under *Diplodiscus* by Travassos (1934) are: *D. subclavatus* Goez, 1782—the type species: *D. megalochrus* Johnstone, 1912; *D. microchrus* Johnstone, 1912; *D. doyeri* Ortlepp, 1926; *D. pygmæus* Lütz, 1928; *D. amphichrus* Tubangui, 1933; and *D. cornu* (Diesing, 1836). About the systematic position of the last species Travassos feels doubtful.

Comparing all the above-mentioned species recorded up to the present time, I find that reliable specific differences can be based on the position of the genital pore, the excretory pore and the excretory vesicle; the arrangement of the collecting tubes of the excretory bladder; the anterior extent of the vitellaria and the size of the eggs. In *D. doyeri* the genital pore is much anteriorly placed, *i.e.*, just behind the level of the hinder border of oral pouches, the excretory pore lies immediately in front of the acetabulum and the elongate bladder passes ventrally to the anterior margin of the latter. In *D. amphichrus* the genital pore and the cirrus-sac lie some distance behind the intestinal bifurcation while the excretory bladder and the pore lie immediately or a short distance in front of the acetabulum. *D. subclavatus* and *D. megalochrus* agree in the position of the genital pore but differ in the position of the excretory pore which lies near the centre of the acetabulum in the former and at the extreme posterior end of the body in the latter. The new species, which differs from the last two species in the slightly more anterior position of its genital pore, is characterised by the position of the excretory pore midway between the centre of the acetabulum and the posterior end of the body. In *D. subclavatus*, according to Fukui (1929), the bladder receives, besides the main canals, a pair of canals from the acetabulum. In my species I did not come across such an arrangement but from the centre of the acetabulum there runs postero-dorsally a median vessel to join the bladder at the point where it narrows down into the excretory canal. Besides this difference the size of the body and the anterior extent of the vitelline follicles also differ in the two species. The Australian species, *D. megalochrus*, has however, smaller eggs.

Recently, Yamaguti (1936) described a new sub-species of *D. amphichrus* —*D. amphichrus japonicus*. This form should not be assigned to Tubangui's species on account of the more anterior position of its genital pore in which feature as well as in the extent of the vitellaria it agrees with *D. subclavatus* but differs from it in the size of the body, position of the excretory pore which lies in front of the acetabulum, in the arrangement of the excretory branches in the acetabulum and in the size of eggs. These differences, in my opinion, are important enough to necessitate the creation of a new species for the Japanese form for which I propose the name *Diplodiscus japonicus*.

Diplodiscus pallascatus ~~n. sp.~~ (fig. 18-20). MANTER AND PRITCHARD 1964

Host : *Bufo regularis* REUSS; 34 specimens in intestine.

Locality : Kasongo (Maniema).

Specimens : Mus. Roy. Afr. Centr., nr 32.922 (holotype); nrs 32.923/32 (paratypes). — U. S. Nat. Mus. Helminth. Coll., nr 59.632 (paratype).

Description (20 specimens measured) : Body conical, 0.489 to 1.541 long by 0.281 to 0.791 wide, widest immediately anterior to acetabulum. Cuticula smooth except for minute papillae bordering apertures of oral sucker and acetabulum. Eyespot pigment dorsolateral to œsophagus, either diffuse or in two compact masses. Oral sucker 0.112 to 0.235 wide by 0.160 to 0.328 long including oral diverticula; diverticula, arising from posterodorsal part of oral sucker, about same length as oral sucker proper. Acetabulum relatively large, 0.275 to 0.724 wide by 0.235 to 0.570 long and 0.096 to 0.509 deep; aperture 0.074 to 0.335 long by 0.067 to 0.469 wide; cavity containing a central, sucker-like papilla 0.067 to 0.214 long by 0.067 to 0.235 wide; lumen of papilla about 0.027 to 0.101 in diameter. Sucker ratio 1 : 1.77 to 3.18. Œsophagus ventromedian to diverticula, 0.176 to 0.288 long, usually sinuous, rarely straight; œsophageal bulb directed posterodorsally, 0.045 to 0.121 in transverse diameter; caeca wide, relatively straight, extending to anterior edge of acetabulum or somewhat beyond.

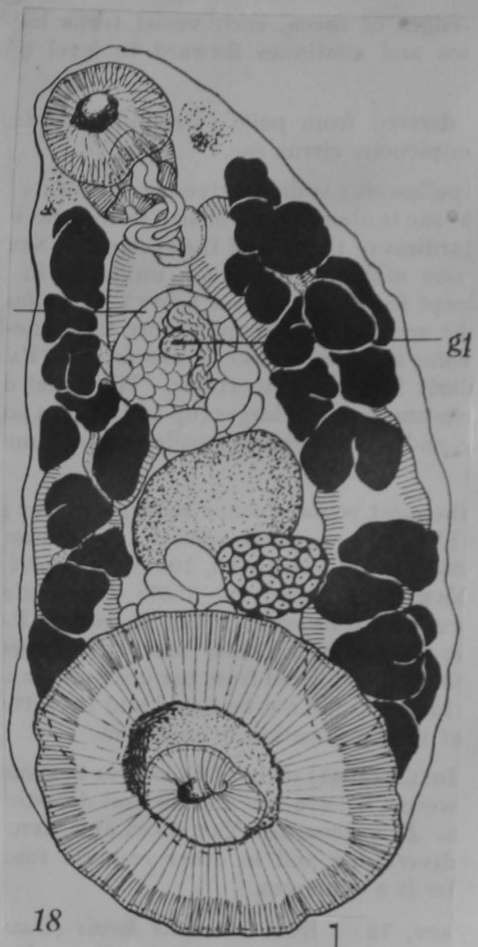
Testis transversely oval, 0.069 to 0.221 long by 0.115 to 0.335 wide, smooth or slightly indented, immediately posterior to midbody and often as wide as intercaecal space. Cirrus sac between caecal bifurcation and testis, spherical, 0.144 to 0.216 long by 0.133 to 0.192 wide containing tubular seminal vesicle and numerous large cells. Genital pore median, midway between bifurcation and testis, about one-third distance from anterior end of body.

Ovary submedian, intercaecal, immediately posttesticular, 0.048 to 0.160 long by 0.064 to 0.200 wide. Uterus descends a short distance, then ascends dorsally, confined to intercaecal area; eggs one to 26 in number, 0.099 to 0.136 long by 0.064 to 0.086 wide, majority 0.112 to 0.128 long by 0.072 to 0.080 wide. Vitelline follicles relatively large, 30 to 40 in all, ventrolateral to caeca, extending from level of œsophageal bulb around caecal tips and joining medianly posterior to ovary; follicles rounded or oval in small specimens, somewhat irregular in larger specimens.

Excretory vesicle rounded or oval, median, dorsal to anterior part of acetabulum, 0.064 to 0.214 long by 0.067 to 0.214 wide; excretory pore opens on median line dorsal to vesicle. One pair of lymphatic vessels extends forward along median edges of caeca, each vessel turns laterally across ventral surface of caeca and continues forward to level of oral sucker.

The name *pallascatus* is derived from *palla* (=rounded) and *askos* (=bag), and refers to the conspicuous cirrus sac.

Discussion : *Diplodiscus pallascatus* is distinctive because of its large, spherical cirrus sac. The cirrus sac is about equal in size to the oral sucker (not including diverticula) regardless of the size of the specimen. Sexually mature specimens less than one millimeter long are unknown in other species of this genus; and, except for *D. doyeri* (see below), *D. pallascatus* is the only species in which the acetabulum occupies more than one-third of the body length. *D. pallascatus* seems most like *D. subclavatus* (PALLAS, 1760), DIESING, 1836, particularly in body proportions. The chief differences seem to be that *D. subclavatus* is much larger (up to 12 times larger), supposedly lacks a cirrus sac, and has relatively smaller acetabulum and vitellaria.



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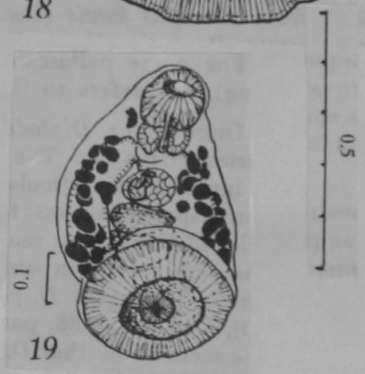

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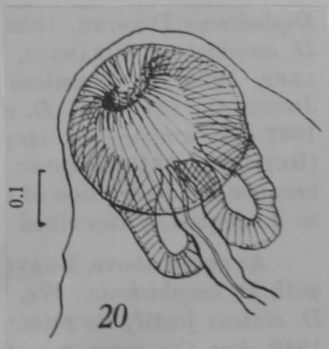

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-OVER-

Bravo-Hollis (1941) is the most recent author to appraise the genus *Diplodiscus* Diesing, 1836. She recognized six species : *D. subclavatus*; *D. amphichrus* Tubangui, 1933 (syn. *D. sinicus* Li, 1937); *D. doyeri* Ortlepp, 1926; *D. japonicus* (Yamaguti, 1936) Li, 1937; *D. megalochrus* Johnston, 1912 (syn. *D. microchrus* Johnston, 1912); *D. mehrai* Pande, 1937. *D. amphichrus magnus* Srivastava, 1934, and *D. unguiculatus* (Rudolphi, 1819) Diesing, 1836, were omitted from her discussion and key because the description of the former could not be found and the latter was so inadequately described that its classification is uncertain.

As noted above, Bravo-Hollis (1941) reduced *D. sinicus* to synonymy with *D. amphichrus*. We, however, believe the minute oral diverticula of *D. sinicus* justify its retention. *D. melanosticti* Yamaguti and Mitunaga, 1943, has the same minute diverticula and in other respects resembles *D. sinicus* of which we consider it a synonym.

Diplodiscus doyeri Ortlepp, 1926, from *Xenopus laevis* (Daud.) in South Africa was transferred to a new genus, *Progonimodiscus*, by Vercammen-Grandjean (1960). *Progonimodiscus* is characterized by a genital pore anterior to the esophageal bulb, short ceca, postcecal vitellaria, single testis, and lobed peduncle in the acetabulum.

YUEN, 1962

Diplodiscus sacculosus sp. n.
(text figs. A and B)

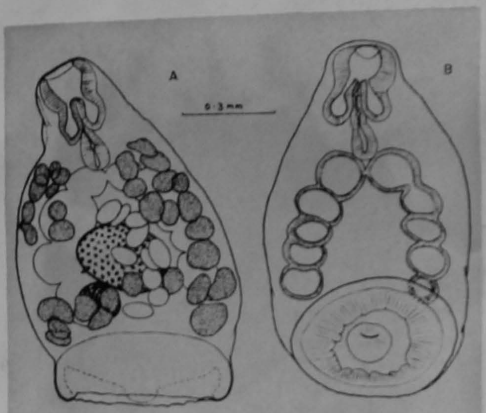
Diagnosis (based on two unflattened specimens): Body conical, 1.2 to 1.3 long, 0.71 to 0.78 in maximum width at testicular level. Oral sucker ventroterminal, with well-developed pair of posterior diverticula; sucker 0.21 to 0.22 wide, 0.15 to 0.18 long excluding diverticula; the latter 0.11 to 0.13 long, 0.09 to 0.11 wide, with median walls close together. Esophagus 0.24 to 0.28 long, muscular, enlarged posteriorly to form a club-shaped bulb 0.10 to 0.12 long, 0.082 to 0.084 wide. Ceca of equal length, terminating 0.048 to 0.11 from anterior margin of acetabulum, with characteristic constrictions forming discrete saclike divisions with width of 0.17 to 0.20. Acetabulum 0.56 to 0.64 in diameter, at posterior end of body, directed ventrally. Center of its cavity with muscular suckerlike structure 0.11 to 0.16 in diameter.

Testis single, ovoid, 0.19 to 0.28 by 0.21 to 0.34, median, in middle third of body, intercecal or overlapping ceca slightly. Cirrus pouch small, inconspicuous. Genital pore submedian, slightly anterior to intestinal bifurcation.

Ovary submedian, posterior to testis, oval, 0.11 to 0.14 by 0.14 to 0.15. Vitellaria consisting of lateral fields of large, distinct follicles extending from level of esophageal bulb to anterior margin of acetabulum; fields separate anteriorly, more or less confluent posterior to testis. Uterus short, intercecal; eggs few, operculate, 0.105 to 0.115 by 0.063 to 0.075.

Host: *Rana erythraea* Boulenger.
Site: Rectum (?).
Locality: Kuala Lumpur, Selangor, Malaya.
Type specimens: Holotype and paratype, USNM Helm. Collections No. 59686.

Discussion: The structure of the ceca distinguishes *Diplodiscus sacculosus* from the seven species of *Diplodiscus* previously reported from anurans. It differs from *D. doyeri* in position of the genital pore, and from all others in egg size except *D. amphicrus* which, however, is larger than *D. sacculosus* and has smaller suckers.



TEXT FIGURES A AND B. *Diplodiscus sacculosus* sp. n. A, ventral view of entire specimen; B, ventral view drawn to show characteristic sacculations of ceca.

Diplodiscus sinicus Li, 1937

L. V. Li (=Li Lai Yung), 1937

Diplodiscus sinicus ~~sp. nov.~~ (fig. 1, 2 & 3)

Cuticle smooth, with the exception of borders of anterior and posterior suckers which are provided with numerous tiny papillae. Body 3.1-5.5 mm. in length and 0.968-1.76 mm. in width; narrower anteriorly and broader posteriorly; cross-section circular. Eye spots may or may not be found on either side of the esophagus on dorsal surface. Oral sucker terminal, 0.352-0.636 mm. in length by 0.334-0.598 mm. in width including pharyngeal pockets, the latter separated by a common median wall. Esophagus 0.331-0.598 mm. long, and arises ventrally from oral sucker. It extends posteriorly and enlarges somewhat to form an inconspicuous bulb measuring 0.078-0.136 mm. long by 0.058-0.078 mm. wide. Masses of Begleitzellen surround greater portion of esophageal tube. Intestinal branches end equally or subequally before edge of posterior sucker which measures 0.88-1.30 mm. across. Conical papilla 0.246-0.387 mm. in diameter and located in the center of the large and strong sucker.

Testis single, median, somewhat oval to round, measures 0.475-1.144 mm. wide by 0.272-0.616 mm. long and is transversely placed. Cirrus sac roundish to slightly oval, 0.117-0.195 mm. in length by 0.113-0.136 mm. in width. Genital pore median, between intestinal bifurcation and testis.

Ovary small, nearly spherical, to one side of the median line, 0.195-0.273 mm. long by 0.214-0.273 mm. wide, immediately following testis and usually touching it. Mehlis' gland and ootype median, behind ovary; Laurer's canal opens posteriorly in the region opposite ovary. Uterus generally short, coiled, intercecal. Vitellaria distinctly follicular, extending from level of intestinal bifurcation to posterior sucker. These vitelline bodies are arranged in two groups, one in front of testis and the other behind it. Those of the latter group meet medially behind ovary, while those of anterior group do not show any tendency to meet anteriorly. Total number of vitelline follicles from 36 to 46.

Eggs few to many, oval, thin-shelled, 0.101-0.113 mm. long by 0.058-0.062 mm. wide. Embryos already formed when eggs are being laid. Hatching of one of the eggs was once observed half an hour after it was deposited.

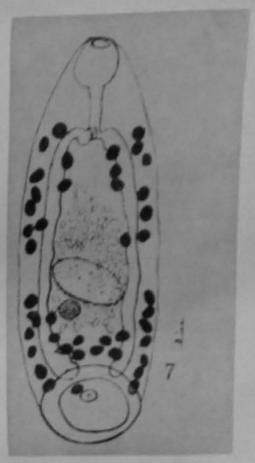
Excretory system takes its origin at posterior sucker. Radiating to margin of posterior sucker are 11 to 13 minute collecting tubules which form 7 large radiating tubules. The latter soon merge into a main excretory tubule on each side of the conical papilla. Each of these two main excretory tubules passes forward into body proper turning back on itself on ventro-lateral surface of excretory bladder and taking a transverse course toward the side of body where each, then, continues forward to level of pharyngeal pockets. The longitudinal tubule splits midway into two parallel branches which soon reunite. At the oral sucker each tubule turns posteriorly and passes median to the cecum of its own side and then turns dorsad in front of testis and passes along dorso-medial wall of cecum to a position behind level of ovary where, after looping over itself, it unites with its fellow of the other side to open into anterior end of excretory bladder. The bladder is an active contractile organ sending out its wastes through a dorsal median pore in front of posterior sucker.

Hosts: *Rana rugulosa* and *Rana limnocharis*.

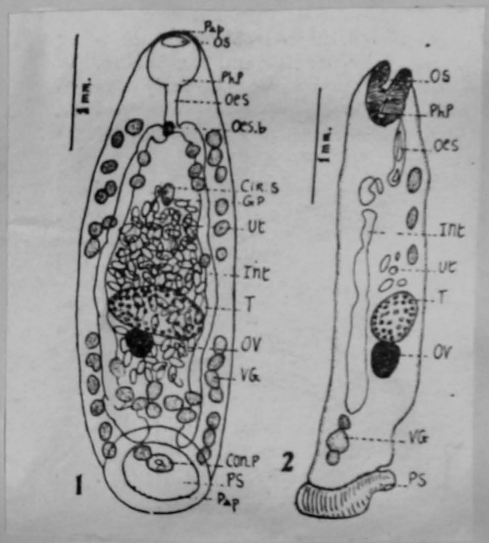
Location: Usually rectum and large intestine, rarely urinary bladder.

Locality: Canton and Amoy.

Types: In the Department of Biology, Lingnan University, Canton.



after Li from Bravo-Hollis (1941)



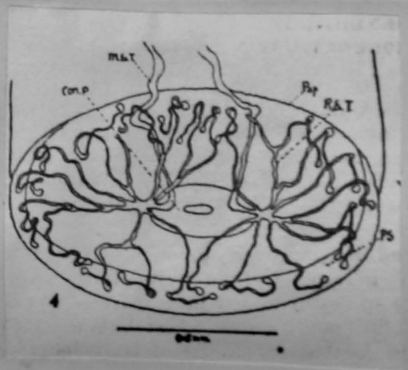


Fig 1. *Diplodiscus sinicus*, ventral view. Fig. 2. *D. sinicus*, sagittal section.

4

Fig 4 *Diplodiscus sinicus*, showing arrangement of excretory tubules at the posterior sucker.

Mukherjee (1966) believes this is a syn. of *D. amphichrus*

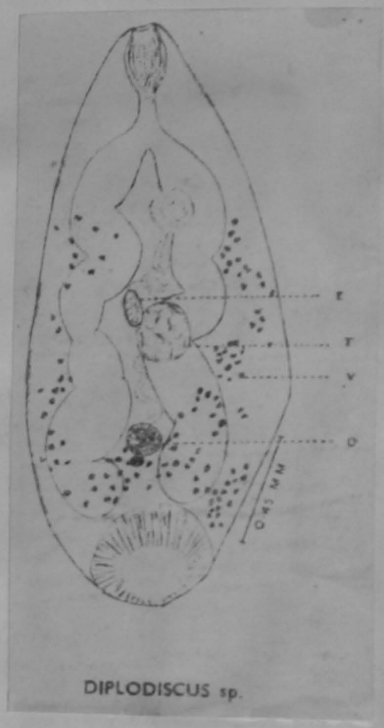
- over -

This worm differs from the American genus *Megalodiscus* Chandler, which has often been classified under the genus *Diplodiscus*, in its possession of a single testis. It differs from *D. subclavatus* (Pallas, 1760) in the size of its eggs, and in the position of its genital pore which opens at some distance behind the intestinal bifurcation, and above all, in the fact that the testis is single in both mature and immature worms showing no tendency towards a separation into two. The present form, however, appears to be most closely allied to *D. amphichrus* Tubangui, 1933 and its sub-species *japonicus* Yamaguti, 1936. It differs from the former in total size as well as size of internal organs and other parts and in the arrangement of the vitelline follicles which, in the present species, do not meet anteriorly in the median line. The excretory system was not adequately described in *D. amphichrus* so that a comparision with the present form is not possible. The present species differs from *D. amphichrus japonicus* in size, in the position of its ovary which is immediately post-testicular and usually touching the testis, in the position of the genital opening which opens at some distance behind the intestinal bifurcation and, finally, in possessing, on each side of the conical papilla, seven large excretory tubules which radiate into 11 to 13 minute collecting tubules, the latter reaching the margin of the posterior sucker. In view of these differences between my specimens and the described species and subspecies of the genus, I regard them as a new species and propose the name *Diplodiscus sinicus*.

Diplodiscus sp. Anjaneyulu, 1967

Host: Pila globosa Swainson, snail; gut

Amphistomes are parasites in poikilothermous as well as homoiothermous vertebrates. Their cercariae after emergence from the snail hosts encyst on suitable substrata and are later picked up by vertebrate hosts. However, Honer (1960, 1961) reported and described adults of *Diplodiscus subclavatus* var. *paludinae* from the snail *Paludina vivipara* at Netherlands and stated "It is hoped that this paper may lead to similar observations by other workers in this field". In a study on Digenea from various hosts at Guntur (Andhra Pradesh, India) several egg-producing stages of an amphistome referable to the genus *Diplodiscus* were recovered from the gut of the snail, *Pila globosa* Swainson and it was considered desirable to make a record.



DIPLODISCUS sp.

OBSERVATIONS

	1	2	3	4
Body length	2.25	2.79	2.58	2.35
Breadth	1.05	0.92	0.98	0.98
Oral sucker	0.24/0.20	0.23/0.20	0.33/0.23	0.21/0.18
Acetabulum	0.38/0.48	0.44/0.44	0.51/0.57	0.39/0.43
Oesophageal bulb	0.096/0.12	0.10/0.11	0.12/0.10	0.11/0.11
Egg	0.12/0.052	0.116/0.68 0.132/0.060	—	—

The oral sucker and acetabulum are well developed. But the accessory sucker on the acetabulum is lacking. Digestive organs are well developed, the caeca extending upto the acetabulum. The single testis and ovary appear rounded. The uterus is mostly a narrow coiled tube. Genital atrium and terminal parts of the reproductive ducts are prominent. The general level of development of the reproductive system at a glance does not appear to be high (Figs. 1). On closer examination it is revealed that the testis is resolved well displaying fully developed spermatozoa. The vitelline reservoir is packed with cells containing the refringent precursors of the egg shell. However, the vitelline glands themselves do not appear to have reached full development. There is indication of liberation of ova. Spermatozoa could be noted in the uterus and in two cases eggs were present. From the measurements of the specimens and the general topography of the structures it appears that we are dealing here with a species of *Diplodiscus* very close to *D. mehrai* Pande, 1937 reported from the rectum of frogs and toads in India.

DISCUSSION

In Honer's collection was a specimen which had reached a high level of development containing 19 eggs. It is remarkable that although conditions in the snail gut are significantly different from that of the frog rectum yet there is obtained an appreciable development leading to egg formation. Understandably amphistomes of poikilothermous vertebrates could develop to maturity in invertebrates. In the genus *Diplodiscus* it is known that cercariae may encyst on skin of frogs.

-OVER-

It has been also shown that tadpoles may swallow cercariae which undergo encystment in the oesophagus followed by excystment and development further along in the intestine (see Dawes 1956, p. 662). Recently Macy (1960) has reported that cercariae of *Megalodiscus microphagus* Ingles, 1956 could be passively swallowed by tadpoles and the cercariae become tailless and develop into egg producing stages apparently without the necessity of encystment. It would be of interest and importance to know just what becomes of the cystogenous glands in such a case. In the present instance it would appear that the apple snail had accidentally ingested the metacercariae.

Obviously in amphistome life cycle various possibilities exist. In this connection it is tempting to reiterate La Rue (1951) who said "Each species seems to play the game of parasitic life within the broad rules laid down by, and for its family, but it appears to have developed within this code its own special rules and regulations, its own deviation from what we poor humans assume to be normal and regular for the family."

G. ANJANEYULU, 1967
INDIAN J. HELMINTHOL. 19(1): 23-26

DIPLODISCUS

Halltrema Lent et Freitas, 1939

Generic diagnosis. — Paramphistomidae, Schizamphistominae: Body elongate conical, papillated anteriorly. Oral diverticles prominent. Acetabulum terminal, not very large. Esophagus without posterior bulb; ceca sinuous, terminating in front of acetabulum. Testes branched, tandem, in pre-ovarian median field, overreaching incurved ceca laterally; anterior testis at about midbody. Cirrus pouch and genital sucker present; genital pore median, pretesticular. Ovary median, posttesticular. Uterus in median intercecal field, dorsal to testes; eggs large. Laurer's canal not observed. Vitellaria indistinct (possibly distributed along ceca, mostly outside these). Excretory pore dorsal to acetabulum. Lymph system consisting of two pairs of longitudinal canals. Parasites of chelonians.

Genotype: *H. avitellina* Lent et Freitas, 1939 (Pl. 47, Fig. 579), in stomach and intestine of *Podocnemis expansa*; Brazil. (Chelonia)

HALLTREMA